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EDITORIAL NOTES.

Passing of the Illuminating Power Standard.

WE should imagine that a legislative change has never been proposed in which the conditions are all so eminently favourable as are those to-day for a transfer of the standard of the quality of gas from illuminating power to calorific value; and yet last Thursday arrived, and the Bill of the South Suburban Gas Company came before the Unopposed Bills Committee for their final ratification, with certain of the local authorities in the area still unfriendly inclined to the alteration from the one standard to the other, though not (in view of their exemption from the operation of the calorific clause, and the maintenance to them of the illuminating power standard) in active opposition. They must, however, surely soon see that in every respect conditions and competent opinion are arrayed against them. The London County Council, the Lewisham, Camberwell, and Lambeth Borough Councils, the County Borough of Croydon, the Bromley Council, and the urban districts of Bexley, Erith, and Penge are all ready, willing, and anxious to throw over the effete standard, and have one that assures the quality of gas required in the present times. The Board of Trade, too, indicate at once an indulgence to the objecting authorities (there can only be one or two now standing out), and a desire to facilitate the setting-up of the calorific standard when the parties are of one mind on the subject, by assenting to the Board being invested with authority to extend the calorific value provisions to all the outstanding districts when, by wisdom's aid, the authorities there wake up to the singular—we were almost writing "eccentric"—position that they occupy in the matter.

The general lines of the South Suburban calorific value clause (which does away entirely with the penal conditions of testing for illuminating power in all but the area or areas declining to be subject to it) were dealt with in our columns on July 9 (p. 95); and in our "Parliamentary Intelligence" to-day, the text of the clause appears with all the conditions. Briefly, the standard is 540 B.Th.U. gross per cubic foot; but penalty is not inflicted until there is transgression below the point of 475 B.Th.U. gross, subject to terms as to testing, and averages of the one day and two following days as fully set out in the clause. The sliding-scale of penalties for progressive deficiencies is also given. This is the first calorific standard adopted in this country, as we pointed out a fortnight ago, that can claim the title to being all-British, or "national," as Mr. C. E. C. Browne (of Messrs. Dyson and Co.) termed it in explaining the matter to the Unopposed Bills Committee, as in the predecessors "calories per cubic foot" constituted the expressions of the prescription. The Chairman of the Unopposed Bills Committee considered it necessary that the gas profession should definitely agree upon what would be desirable for the standard; and after Mr. Browne's and Mr. Charles Hunt's explanations, members of the Committee at once saw that "B.Th.U. gross per cubic foot" is the prescription that will meet most favour in the gas industry, and will indeed be popularly regarded as the best. While saying this, the Committee, of course, will understand that the terms of the prescription ought not to be made to include a stereotyped number of B.Th.U. as a standard applicable to all gas undertakings. Conditions vary in regard to both coal supply and working; and there are cases where a variation from the B.Th.U. specified in this case may be highly desirable.

The calorific value standard has now set its feet firmly in the parliamentary arena, as a condition in statutory gas supply; and its application to the two large concerns represented by the amalgamations of the South Suburban, Bromley, and West Kent Companies and by the Wandsworth, Mitcham and Wimbledon, and Epsom Companies has created precedents that will henceforth carry the change from standard illuminating power to standard calorific value further every session. For this change gas undertakings entering Parliament in future must be prepared. The Boards of neither of the two Companies named (though they have not the slightest objection to the alteration, but, on the contrary, welcome it) had any notion six months ago, when they were at the initial stages of the promotion of their Bills, that so soon their standard of quality would be entirely transformed from the base upwards. But so it is, and so it will be for other concerns in future sessions. It may also be anticipated that there will be promoters in the immediately coming sessions who will now propose on their own initiative the dislodgment of the illuminating power standard in favour of the calorific value one.

Sulphate Making at Small Gas-Works.

THE managers of small gas-works that have had the chemical clause placed upon them, through the aggressive action of the Alkali Manufacturers' Association, should now consider the question of producing sulphate of ammonia on their own account. There are various reasons why they should do so. The first and foremost is that in gas-works with very low annual makes of gas, sulphate of ammonia can to-day be profitably produced, though not so profitably or economically (the sulphate of ammonia production per ton of coal carbonized cannot be so high) as on large-scale working. The second reason is that—at least in the case of ammoniacal liquor—this action on the part of small works will, in their cases, prevent the chemical manufacturers from dictating and controlling the terms for the liquor. It will save expense of carriage, and, where practised, of concentration. We need only to-day speak of running liquor to waste in connection with the works that are at the lowest end of the scale in gas make. Of course, the disposal of ammoniacal liquor is only one side of the question that the gas industry has at the present time with the chemical makers; but it is not an unimportant side. If the chemical manufacturers and Parliamentary Authorities continue to force the hands of the industry, then everywhere, where it is possible to do so with some profit attached, the manufacture on their own account of sulphate of ammonia will be urged upon small gas undertakings. It is the only partial way out of the new difficulty created by the chemical manufacturers; and the latter are, in the quest for domination, driving the small undertakings to it. There is perhaps a very good reason to add to the others why small undertakings should manufacture sulphate of ammonia. They are mostly situated in country districts, where there should be a good demand for the fertilizer for agricultural purposes.

It has been demonstrated that, with certain special modern forms of sulphate of ammonia plant, gas-works producing as low as 5 million cubic feet of gas per annum can profitably enter upon the manufacture of sulphate of ammonia. Mr. Philip G. G. Moon showed this in his Southern Association paper in 1910; and, earlier in the same year, M. Chevalet was describing, before the Société Technique du Gaz, a simple plant that he had applied to gas-works carbonizing only 300 tons of coal a year. There have also been suggestions as to itinerant sulphate of ammonia plant being employed in districts where there are a number of small gas-works clustered within fairly accessible distances. But really, the simple plants that are now available—comparatively inexpensive in construction, and the working of which can readily be understood by any workmen of ordinary intelligence—ought to persuade every small gas undertaking making (say) 5 million cubic feet and over a year to adopt one where the market for ammoniacal liquor is not a fair one, or where carriage heavily depreciates values. Such a plant after a short time will pay for itself, although by one of these simple plants—perhaps one in which recovery is performed by the action of dilute acid—the same high sulphate makes per ton of coal carbonized are not, of course, realizable that are obtained in the larger works where continuous or almost continuous working proceeds, and there

is little waste of ammonia. The conditions warrant the adoption of such plants; and the chemical manufacturers have been supplementing these conditions, though they are hoping the end will be the compulsory sale to them, at their own prices, of all the residual products that gas-works do not themselves work up. If the gas industry fails to convince Parliament, when the industry can get a proper independent hearing, as to the importance of keeping open markets for their raw liquid residuals, spent oxide, and so on, then the industry must look round for the alternatives.

Developing Sulphate of Ammonia Markets.

THE energy of the Sulphate of Ammonia Committee shows no abatement. The commercial spirit of the times is very well diffused among the executive of the organization; and they feel that the more they do, the more they must do—having in view the factors that bear upon the situation in these times. The production of sulphate of ammonia has an expanding base, both at home and abroad. More ammoniacal liquor is now produced, and from more sources, and that is a continuous process. This is obvious from the expansion of gas production, and from the increase in the number of bye-product coke-ovens. There are also men in the electrical industry in these days thinking seriously of adopting gas production and driving (instead of feeding coal under boilers), and so obtaining not only a gaseous agent for motive power, but bye-products in the shape of tar and ammoniacal liquor, and thus sulphate of ammonia. But that is only in the realm of project. What is in the realm of existing and substantial fact is that sulphate of ammonia production is on the increase, and will continue so. Nevertheless, the experts—those who make a close scrutiny of these matters—tell us that there is plenty of room for all the likely increase, if those who can profitably use this fertilizer are, not only at home but in all parts of the world, educated up to its application. Tradition and custom are hard nuts to crack; and they require a load of demonstration to make any good and lasting impression upon them. This is the work the Sulphate of Ammonia Committee have in hand; and year by year there is the call for their educative enterprise from "fresh woods and pastures new."

The Committee cannot afford to break down at any point where they encounter the cold wall of indifference, or adverse circumstances of other orders. Such obstacles must be perseveringly assailed. From the report before us, it is remarked that lectures to agricultural societies and farmers' clubs have been as diligently delivered as ever; but in response to invitations for lectures, the Scottish organizations seem to be apathetic. It is the business of the Committee to be ubiquitous in the matter of lectures and competitions; and therefore perhaps some of the large gas undertakings and the Gas Associations of Scotland can influence a better passage-way for the lecture work of the Committee across the Border. It is also observed that excellent sulphate of ammonia advertising crop results followed the competitions last year, in which Scotland had good part; but the dry weather of the year had a reducing effect upon the number of the competitions. This year, however, a greater number of competitions have been organized. The Committee also want to extend the area of their work to the furthermost parts of the earth. Markets have to be created abroad; and the markets that exist have to be nursed and still further exploited, so that they may gain in absorbent strength.

There is likewise the new field for their enterprise at home. During the past two or three years, we have been keeping our readers informed as to the campaign that has been going forward in this country in an attempt to establish beet cultivation and the beet-sugar industry here, which cultivation and industry in Germany have produced there an enormous demand for sulphate of ammonia. As far back as April 5, 1910, when writing on this subject, we said: "British agriculturists want educating on this question of "beetroot cultivation, and the country on that of the en- "couragement of the establishment of a home sugar industry. "The reawakened interest in the question is a matter which "the Sulphate of Ammonia Committee must follow up "closely; and there must be preparedness on their part "with information as to what is done in Germany in the "matter of the application of sulphate of ammonia in the "cultivation of beet." The time has arrived for activity on the part of the Committee; and they are active. As was announced some time since in the "JOURNAL," arrangements have been made for the establishment of a beet-sugar factory in Norfolk—which movement was a condition precedent to any lasting interest in the matter by the farmers of Norfolk and Suffolk. The Committee have been supplied with further information by Mr. Thomas Glover, of Norwich. The interest of the farmers has been aroused; and the Committee are among them with a scheme that shows the farmers a strong faith in demonstrating to them that sulphate of ammonia is the best nitrogenous manure for sugar beet. It was a matter that invited enterprise on the part of the Committee; and, consequently, they made arrangements to supply nineteen prominent farmers with the necessary artificial manures and lime for 120 acres of land placed under this crop. Beyond this, plot experiments over 2 acres of land are being conducted with the view to obtaining information as to new methods of manuring, so as to ascertain whether any improvement in weight of crop or sugar content can be obtained. The whole gas industry will wish the Committee, the farmers, and the beet-sugar factory abundant success.

However, all this responsible, necessary work costs money. Intermittent expenditure will not do. It must be continuous; and it must be enlarged. The Committee prefer to supplement their revenue for the work not by increasing the *pro ratâ* subscriptions of existing contributors, but by obtaining tangible interest and sympathy in the form of new contribution from those beneficiaries of the work of the Committee who are not yet subscribers. Additional subscribers have been obtained during the past year; but there has not been the increase that the Committee have a right to expect. Especially is this the case in respect of the undertakings that do not make sulphate of ammonia. They are, however, producers of ammoniacal liquor, and are therefore interested in the maintenance or increase of the prices of sulphate of ammonia by the creation of new demand. Such gas undertakings are as free to become subscribers as sulphate of ammonia producers, and to do so on the modest basis of 7d. per million cubic feet of gas produced. There are a few such undertakings already subscribers; and the assistance of many more will be heartily welcomed. In all propaganda work of this kind, we have to think of the future as well as of the present, and to judge the future by current tokens. In the light afforded by such thought and judgment, we see the need of full-measure support of the Committee on the part of non-subscribing gas undertakings. In the paragraph introducing the report in our "Miscel- "laneous News" columns, the address will be found to which intimations can be sent of a willingness to become subscribers.

Unemployment Insurance.

No one will have envied the work and responsibility of the Umpire who has been determining the very fine points that have arisen as to workmen in respect of whom contributions are payable or are not payable under the unemployment section of the National Insurance Act. The insured trades comprise building, construction of works, shipbuilding, mechanical engineering, ironfounding, construction of vehicles, and saw-milling. In many cases, the description of trade alone leaves no room for doubt as to whether or not contributions are payable. But there has been a perfect avalanche of doubt as to workmen (and there is a legion of them) that may be on the border line of the trades; and in regard to these, the Umpire has had the task—a task involving hairbreadth distinction—of discriminating between them as to whether or not contributions are payable. There is no question about the care the Umpire has taken, though it must be in such a matter as this that people will not in all cases be wholly satisfied with his judgment. This cannot be avoided, and must have been expected; and the discontent in certain instances is bound to continue. It is easy enough to pick out apparent contradictions in decision; it is less easy to understand why certain workers have been placed among those for whom contributions are payable, while others are placed outside the contribution-paying limits. Perhaps it is better, however, not to specifically refer to cases that appear to be incongruous. The Umpire has no doubt had certain rules to guide him; but, even so, these rules could not have covered the multitude of workers in regard to whom employers themselves were totally uncertain as to whether or not the unemployment insurance net incorporated them or otherwise. Those who have followed the decisions published in our columns will probably still find difficulty, in the maze of distinction, of properly interpreting intentions in respect of some of their workmen. In fact,

it will take time to strike-up a perfect acquaintance with the distinctions that have been drawn. One of the most explicit lists of decisions respecting gas-works men about whom any doubt has existed is that published last week in our pages by Mr. Alex. Wilson, from whom to-day a short letter interpreting a couple of terms also appears in our "Correspondence" columns. The National Insurance Act is not lightening the work of gas offices. The only consolation is that the burdens are fairly equally distributed among employers in the trades concerned.

The Industry and the Chemical Trade.

Bearing upon the subject of our article in last week's issue, it may be stated that an effort is being actively made, on behalf of the gas industry, to have the whole question that has arisen in connection with the trade in raw residual products reconsidered—if possible, by an impartial and independent tribunal. We hope that good may come of it; and that the Parliamentary Authorities will yet see that the interests of the public, and of the gas industry who serve that public under conditions formulated by Parliament, are not subscribed to by the market limitation that the chemical traders desire, for their own special behoof, at the hands of Parliament. We trust that the steps now being taken will result in the preparation of a strong case for a fuller inquiry, from both the industrial and public standpoints. Meanwhile, we see that the "Chemical Trade Journal," which quickly got gravelled for argument in defending the chemical manufacturers and their present piece of work, thinks the time has arrived when lack of argument justifies abuse. In a reference to the Swansea and West Kent cases, our contemporary incidentally refers to the "hysterical outbursts of the 'JOURNAL OF GAS LIGHTING.'" We are quite indifferent to this form of attack when reason and argument fail our opponents. Before the gas industry itself, there is no cause to defend the position we have taken up—the action of the industry itself is a sufficient justification of our part in the matter. Coming from the "Chemical Trade Journal," its reference to our action, and its own long silence in this important matter, may be taken as a very real compliment to ourselves.

Publicity.

The Electric Publicity Committee never thoroughly secured the sympathy and encouragement of the electrical industry. The fact was they did not entirely deserve it. The electrical industry were not at one with the Committee over their methods, which included the slandering of gas with a brazen-faced indifference as to truth that did not altogether suit the notions of many people with consciences and a sense of fairplay. Other people, too, have thought that the Electricity Publicity Committee lacked those all-important qualities of initiative and good taste. However, the Committee seem to have got a few new men associated with them; and they have moved their centre of activity. There now comes up the question of extending and developing the work of the organization. The Council of the Municipal Electrical Association have taken the Committee under their wing, or have given them a pat on the back in their last annual report. It seems that a scheme for the permanent establishment of the organization has been prepared; and the Council of the Association hope that the electricity committees of the various municipalities throughout the country will give the necessary support to this "very important development of electric supply." It is not clear why the development of the work of the organization is called an "important development of electric supply." However, they think support is desirable in view of the great efforts now being made by the gas undertakings in the same direction.

Further Municipal Gas-Works Results.

There are more results of a favourable nature to be chronicled, with regard to the operations of municipal gas undertakings for the past financial year. There is a net profit of £8552 at Carlisle; and out of this the suspense account (£1923) is to be paid off, a deficit of £599 on the baths is to be met, and the balance will be paid over to the city fund. Mansfield announces a profit of nearly £7000 upon the past year's working of the gas, water, and electricity undertakings—the gas-works surplus being £2650, of which £1500 is to go in relief of the rates, and the remainder to the reserve fund. The increase in sales of gas at Mossley amounted to over 10 million cubic feet, which is a sum that has never before been approached in the history of the undertaking. Out of the net profit of £1005, £700 has been transferred to the borough fund. The receipts from residuals were much higher; and the yield of gas per ton of coal carbonized showed a marked increase. The usual growth in the number of consumers has been maintained at Salford, though a trifling decrease (equal to only 0·12 per cent.) was experienced in the quantity of gas sold. This falling off, however, is due to exceptional causes—the sale of the rights to supply gas in the urban district of Little Hulton, and the effects of the national coal strike. Considerably more was received for residuals than in the preceding twelve months; and, in the result, there is a balance of £18,000 which has been transferred to the district fund account, as compared with £15,750 last year. Of a surplus of £700 at Tiverton, £200 has gone to the rates, and £500 to the reserve fund. The profit at Warrington amounts to £16,367. The total quantity of gas made and sold at Wigan showed a substantial increase, partly due to the greater use of gas for cooking purposes during the very hot summer of last year. There is a net profit of £5290; and the public lighting, which is free, is put down at £5509. Thus the actual net profit for the year is £10,799, compared with £10,086 for the year before.

Gaslight and Coke Company's Dividend.

We are informed by the Secretary of the Gaslight and Coke Company (Mr. Henry Rayner) that the accounts of the Company for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 17s. 4d. per cent. per annum, carrying forward to the next account the sum of £768,407 18s. 2d. The dividend for the past year was at the rate of £4 14s. 8d. per cent. per annum, with a balance of £699,350 carried forward in June and of £726,747 in December.

Isle of Wight Gas Association.

A meeting of this Association was held at Freshwater on the 13th inst. The company were met at the gas-works, Norton, by Mr. E. J. Lord, the Manager, accompanied by Mr. Snellgrove, a Director. An inspection of the works was made, including the new purifiers with Pickering valves, the Winstanley retort-setting, and the spiral-guided gasholder in steel tank. The party then drove in brakes to the Totland Bay Hotel, where they were joined by Mr. G. Ball (the Chairman of the Freshwater Company), and a short business meeting was held. After this an adjournment was made for "high tea," when Mr. Ball took the opportunity of offering a few words of welcome to the Association. A vote of thanks to the Directors of the Freshwater Company was moved by Mr. Riddett, and seconded by Mr. Mears, two Directors of the Ryde Gas Company, who spoke of the sterling pioneer work done by Mr. Ball and Mr. Snellgrove in the foundation of the Company in face of stupendous difficulties. This was responded to by the gentlemen named, who eulogized the services of their officers. The brakes were again entered, and a visit paid to the Company's show-rooms, where the attention of the visitors was specially directed to a new type of geyser which was shown in action.

Centenary of Gas.—A page advertisement in "The Times" last Wednesday was devoted to this subject, and to the evolution of gas lighting and heating. In the centre of the letterpress was a portrait of the Governor of the Gaslight and Coke Company (Mr. Corbet Woodall); over it being a view of Pall Mall by night, and under it one of Beckton. Above the heading, "The Centenary of Gas," were views of the Horseferry Road works in 1842 and of the present offices, with the Company's seal, bearing the motto "Stet Capitolium Fulgens," between them. These form the top portion of an artistic and appropriate border, prominent features of which are the dates which have figured so conspicuously in our columns of late—1812 and 1912.

Tests of Fire-Clay Material.—In the issue of "Progressive Age" for the 1st inst., attention is called to Technologic Paper No. 7 of the United States Bureau of Standards, which contains the results of some very instructive tests of clay refractory material. The authors say that a temperature of 1350° C. (2462° Fahr.) and a pressure of 50 lbs. per square inch represent working conditions. A sample brick or test piece is considered to have failed if it contracts more than 1 inch in a 9-inch length of test piece, or shows marked deformation under this temperature and pressure. It was found that when the sample contained more than 0·22 part of fluxes (or their equivalent) to one part of alumina and three parts of silica, it resulted in failure. When the silica content increases, the basic fluxes permissible naturally increase with it. Poor clays may be improved by admixture with flint clay low in fluxes. Fire-clay material should be burnt at as high kiln temperature as possible. The compression or load test alone should not be relied upon, but softening temperatures and chemical composition should also be considered. The load test is lest important, as pressures to which the brick is subjected in practice become smaller.

PERSONAL.

Mr. H. M. THORNTON, Managing-Director of the Richmond Gas Stove Company, has been appointed a Justice of the Peace for the County of Essex.

Mr. JAMES BEOCHER, who has been for the last six years in the employ of the Kirriemuir Gaslight Company, Limited, has been appointed Gas Manager at Aberfeldy.

It was announced at last week's meeting of the Maryport Urban District Council that Mr. H. MORRIS, the Gas Manager, had tendered his resignation, and that it had been accepted by the Gas Committee.

The employees of the Dunfermline Corporation Gas-Works met in the Imperial Hotel on Friday night and presented Mr. DANIEL MUIR with a dressing-case, on the occasion of his leaving the district for Grantham.

We learn that a Committee of the Directors of the Sheffield United Gaslight Company have, subject to confirmation, appointed to be Superintendent of their Grimesthorpe works Mr. E. FEARON, who is at present engaged at the Salford Gas-Works. There were six candidates interviewed; and the list was later reduced to two. It will be remembered that a few weeks ago, on the occasion of the visit of the members of the Manchester and District Junior Gas Association to Salford, Mr. Fearon read a paper entitled "Some Notes on Carbonization."

In selecting a new Secretary (to take the place of Mr. C. M. Ohren, whose retirement was recently announced) the choice of the Directors of the South Suburban Gas Company has fallen upon Mr. WILFRID WASTELL, at present Deputy-Secretary to the Birmingham Corporation Gas Department. Mr. Wastell, who is forty years of age, has spent practically the whole of his working career with the Birmingham gas undertaking, commencing there 23 years ago as a junior clerk under Mr. Henry Hack, then Engineer at the Saltley Gas-Works. Seven years later, he was transferred to the head offices of the department, becoming intimately acquainted with all the routine work there, and was subsequently promoted to the position of Assistant-Secretary. Between the death of the late Secretary and Manager, Mr. G. Hampton Barber, and the appointment of Mr. R. S. Hilton as his successor, a period of over eight months, Mr. Wastell was entrusted with the administration of the department, and was afterwards appointed Deputy-Secretary. In his long connection with the Birmingham gas supply, Mr. Wastell has made many friends; and we feel sure that his readiness at all times to assist others will make him as many more when he takes up his position in London. Thus both Mr. Wastell and the South Suburban Gas Company are to be congratulated on the appointment that has been made. It may be added that the Board were quite unanimous in selecting Mr. Wastell for the position, out of close upon 500 applicants.

TWO AMERICAN GASHOLDERS.

See also Page 259.

IN the "JOURNAL" for May 28 last, there was reproduced from the columns of the "Engineering Record" an article on the design and construction of the 10 million cubic feet gasholder at the Kingsbridge station of the Consolidated Gas Company of New York; the author being Mr. Herbert W. Alrich, of the Engineering Department of the Company. Numerous detail drawings were included with the article; but at the time it was impossible to give any photographs of the holder. This addition has now been made by Mr. Alrich, who has forwarded an excellent series of photographs of the structure in course of erection, as well as of the Newtown holder of the Company, which was also referred to at the end of the article. A selection of these views will be found on pp. 259-61; and it may be mentioned that the photographs were furnished by the Bartlett Hayward Company, who built both holders.

With reference to one of the photographs of the Kingsbridge holder, it may be pointed out that the barges in the river are at work laying the submerged gas-main—an operation which was the subject of a paper read by Mr. C. C. Simpson, the General Superintendent of the Mains and Services Department of the Company, before the American Gas Institute. This paper, was reprinted, with a number of illustrations, in the issue of the "JOURNAL" for Jan. 24, 1911. The level ground beyond the river is of historic interest, for it was upon this site that the great British military encampment was located at the time of the Revolutionary War. It was from their camp, at this point, that the British troops emerged in the final action which drove Washington and his men from Manhattan Island. In the work of laying out streets and other excavating, there have been found large quantities of buttons, buckles, gold braid, and other relics of the British occupation.

Institution of Municipal Engineers.—A meeting of the North-Western District of the Institution will be held at Clitheroe next Saturday, when the Borough Surveyor (Mr. A. R. Bleazard) will read a paper on "Municipal Progress in Clitheroe." Visits will be paid to the water-works, and to the tar-macadam works of the Harrocksford Lime Company and Messrs. Carter and Co.

NOTES FROM WESTMINSTER.

THERE was little moving last week in the Committee-rooms that was of particular interest to gas men, and yet the little was of importance. The Committee rooms on such sweltering days as those in the forepart of the week are not altogether desirable places—notwithstanding the buzzing electric-fans. Everybody looks hot, and feels hot; and energy seems to flag.

Labour and Amalgamation. We are glad to see that the Labour Members of Parliament took the wise course of not pursuing the project, which was, rightly or wrongly, attributed to them by rumour in the House and its precincts, of blocking the South Suburban and Wandsworth Bills for no other reason than that the measures will be the means of spreading the benefits of co-partnership over a wider area through the amalgamation of non-co-partnership undertakings with existing co-partnership ones, and thus will not prove a blessing in disguise for the trade unions who watch with less resulting material advantage over the welfare of gas workers than is secured by those gas workers who are co-partners, and so watch over their own welfare. Where co-partnership enters the front door, trade unionism seems to make a natural exit from the back; and thus it seems to prove that the one is repugnant to the other, and that they cannot live in the same house. Not that there is any quarrelling between the two. It simply means that trade unionism is not wanted where there is co-partnership; and trade unionism simply falls into a state of decline, until no more, or very little more, is heard of it in co-partnership concerns. The Trade Unions know this; but when members of the Labour Party begin to talk about blocking Bills, in an ineffectual attempt to stop the spread of co-partnership, the wiser ones know that such action will only be to give co-partnership a larger advertisement among the part of the social fabric that they prefer should learn as little as possible about the benefits of the new relations between capital and labour—relations that endow labour with capital and common interests with that desirable and necessary element in our industrial and commercial life.

Calorific Value and Differential Price. The South Suburban Amalgamation Bill has been before the Unopposed Bills Committee of the House of Commons. The main change that has been wrought during the more recent stages of the measure is the new calorific value clause. But in this there has been no alteration since the comment in the leader columns was published a fortnight since. The text of the clause appears in our "Parliamentary Intelligence;" and two or three considerations affecting the general question of the transmutation of the standard of quality are referred to in an earlier page. The terms of the new clause appeared to find complete favour with the Unopposed Bills Committee. Yet another alteration that has been made in the Bill since it left the House of Lords refers to a distant period. It will be remembered that Mr. Rowlands blocked the Bill on second reading; but a course was discovered that met the views of those whose interests the honourable member represented, as well as those of the promoters. We rather think it is due to the Private Bill authorities of the House to say that they kindly intervened, and paved the way with suggestion that found its issue in agreement. West Kent did not like the idea of a differential price in the area in perpetuity; and so it has been settled that, after 1925, the difference in price between the West Kent and the South Suburban areas shall be reduced annually by 1d. per 1000 cubic feet until the difference is finally extinguished.

Peace at Tipperary. For a long number of years, the governing body of Tipperary have assailed the Gas Company every time they have tried to obtain powers to enable them the better to carry out their obligations to the district and to the consumers; but the Company's application for an Order this session, prosecuted through a long lane of opposition, has at length emerged with the parties friendly disposed one towards the other. That is the condition of things that transpired when the Order came in a Confirmation Bill before Viscount Falkland's Committee last Thursday. The Council do not appear, as the result of their antagonism to the Company, to have served any substantial purpose. It is true 6d. has been taken off the proposed maximum price of 5s.; but maximum prices have more a nominal than an actual working value. Some other minor concessions were also made to the Council. But the Council have incurred considerable expense in their long warfare with the Company; and what is anything but a common occurrence is taking place in connection with this Order. The Council are to be allowed to borrow the money expended in parliamentary costs, and to repay same in five years. The Order is being made the vehicle for provision to this effect. After the storm, calm.

Railway Companies and Pipe-Laying. Latterly county councils have been trying to impose road and main-laying clauses heavily weighted with responsibility on gas companies; but where contested they have not been successful in their endeavours. The railway companies have also been making the protective clauses that they seek to impose more stringent than formerly; and in their cases they have had more success through a somewhat apathetic compliance with their demands on the part of gas companies. The Woking Gas Company, however, were not minded to comply with the demands of the London and South-Western Railway Company; and con-

tested their claim for a clause of very wide supervisory and other powers—far in excess of an existing clause, which existing clause is in excess of the common-law rights of the Company. The witnesses for the Railway Company very honestly declared that, under the existing clause, they had not experienced any insurmountable difficulties; but they tried to impress Sir Hugh Law's Committee with the responsibilities of the railway companies. Gas companies have also responsibilities; and there ought to be a mutual respect for respective obligations, and not attempts to increase burdens on one side or the other. The upshot of the discussion was that the Railway Company were told by the Committee that they must be content with the existing clause, with one addition and a few minor amendments. The addition is to the effect that where there is not sufficient space on every bridge to lay a main between the road surface and the structure of the bridge, the Railway Company may require the mains to be carried below, outside, or independently of the structure of the bridge, for which purpose they are to afford reasonable facilities.

Circumstances alter Cases.

The proceedings on the Holmfirth Electric Supply Order were in parts lively enough. Mr. A. M. Paddon represented the local Gas Company, who were the opponents; and Mr. J. D. Fitzgerald, K.C., was the leader for the Order. The latter ought, on principle, to have declined to argue against the Gas Company. He has become a strong protectionist—advocating the protection of rich profit-clad chemical manufacturers by limiting the exercise by the gas industry of its residual products powers. He ought to have been arguing in this Holmfirth case for the protection of the interests of the Gas Company, by limiting the exercise of any powers obtained by the District Council for the supply of electricity. On the contrary, he was arguing in favour of the widest possible competition. When appearing for the Alkali Manufacturers' Association, he argues for a raw residuals purchasing monopoly for the chemical manufacturers, and against a free residuals market. There is wonderful versatility at the Parliamentary Bar.

Holmfirth Electric Order.

The Holmfirth Order came before Sir Francis Lowe's Committee, as did the Cheltenham Order noticed last week; and the same Committee, as in the Cheltenham case, were unsympathetic with the Gas Company. The Holmfirth District Council want to put down an electric lighting system of their own; and, speaking from experience in other places, the years will doubtless come when Holmfirth will be deeply sorry for itself for having dabbled in this speculative business—speculative in such an area, which the best evidence went to prove is not a district where electric lighting can really flourish. It is all very well for Mr. Harry Marsden to come along and declare that, because a little bit of profit is made at Honley, electric lighting will be a success at Holmfirth. The two areas are stated to be totally dissimilar in several ways; and, what is more, the Honley electricity supply leans on to the gas-works. The two businesses are conducted together; and they seem to have much in common to the advantage of electricity, and the disadvantage of the older concern. This is a totally different proposition from one in which the electric undertaking is being run as a separate concern. Mr. H. W. Couzens, Consulting Electrical Engineer, is satisfied there will be a loss on the undertaking; and, in his view, capital expenditure has been seriously under-estimated. A peculiar feature of the case was an attempt on the part of the Council's witnesses to try to weaken the position of the Gas Company and to blacken their reputation by pointing out that they had not been to Parliament since the formation of the concern in 1839. But this was a poor point, in view of the fact that, though the Company are not under modern legislation, they have not abused their position—they have not paid extravagant dividends, nor have they done anything that has affected a healthy record in the Company's relations with the gas consumers of Holmfirth. We remember Sir George Livesey envying those companies in the fortunate position of Holmfirth, who have only competition and the directions of their own consciences and of their own business acumen to keep their commodity at a proper qualitative value, and the charge for it at a low figure. The Holmfirth Gas Company, as Mr. A. E. Buckley, the Manager, showed, has behaved circumspectly in these matters. All the Company opposed for was that they do not believe in municipal trading in a place where it is clear it is pure speculation, and where the Gas Company are one of the largest ratepayers, and will therefore have to bear a large proportion of any losses. However, the Committee allowed the Order to proceed, and without amendment.

Largest British-Built Gas-Engine.—The Lilleshall Company, Limited, of Oakengates, Shropshire, have recently completed two of the largest gas-engines which have, up to the present, been built in this country. The engines drive alternators, and form, together with two similar units, the power plant in connection with the electric railway between Yokohama and Tokio, Japan. The normal output of each engine at 100 revolutions per minute is 2500 B.H.P. They are scheduled, however, to run at 94 revolutions per minute, at which speed the output is 2300 B.H.P. The cylinders are 47¼ inches diameter, with 51-inch stroke. The total weight of each engine is, approximately, 400 tons, of which the fly-wheel, together with the poles, weighs 100 tons, the bed-plate 55 tons, the cylinder 25 tons, and the crank-shaft 30 tons.

ELECTRICITY SUPPLY MEMORANDA.

A Big Breakdown—Inverted High-Power Gas-Burners for Street Lighting—Stupid Electrical Abuse—Borough Surveyors and Other Factors in Street Lighting—The Profit and the Bonus—A False "Guide"—Faversham's Heavy Burden.

London last Monday evening had further evidence of the unreliability of electricity supply, and of the danger of relying upon it solely for illumination where a number of people are brought together. When we talk of the inconstancy of electricity supply, and of its much discredited character for safety, our friends on the other side bristle-up in a fashion most alarming, and most menacing to the maintenance of their own balance. But here is a case in which the facts are so solidly attested by a multitude of people who were relying upon electric traction, and by a multitude of people who had to grope their way to safety by the aid of matches, keeping the while one hand on their valuables lest they should be deprived of them in the darkness, that our irascible friends will no doubt feel that the less said about the matter the better. A fault, a cessation of supply from the Lots Road generating station of the Underground Railways of London, Limited, and a worse condition of things was created underground than would have been the case had the trouble occurred at road level. Trains came to a standstill on both the district and the tube railways; the lights in the lifeless trains failed; stations were thrown into darkness; and lifts remained suspended for many minutes in the shafts. There was great excitement through the sudden change from light to darkness in Subterranean London. Women and not a few men were much agitated by the extinction of the lights and the sudden stoppage of trains in the tunnels, and their anxiety was only partially relieved by the lighting of the oil-lamps that are the stand-bys to electricity. The travellers or would-be travellers who were fortunate enough not to have left the stations, found their way to the outside world again from underground darkness by the aid of the glimmer of matches in the possession of the male section of the unfortunate representatives of the public. In some places the crowds of travellers were so dense that it was deemed advisable to close the station gates. The trouble happened soon after eight o'clock; but half an hour elapsed before the fault was remedied. It was 9.15 (according to one report) before everything was again in working order. The Board of Trade ought to insist (as the London County Council do in the case of theatres and music halls) upon a permanent and always maintained alternative system of illumination to the one provided by electricity for the stations. A few poor oil-lamps, which are difficult to find and light just when wanted, are insufficient for the purpose. The public have a right to be dealt with in this matter on a responsible basis, and be afforded practical protection against the consequences of such a wholesale failure as this one. The effects, actual and potential, of such a breakdown as this form a strong argument against concentration of electricity generating plant, though undeniably the economy of concentration is not a negligible quantity.

Inverted gas-burners for the illumination of public ways are winning a good position among street-lighting authorities where the local gas suppliers are showing enterprise, and are not checked in so doing by municipal possession of the electricity undertaking. The local authorities are learning—Bournemouth, Doncaster, and Guildford are new examples—that the inverted gas-burner has the sole right among existing competitors to be labelled "*ne plus ultra*" in regard to what Mr. Haydn Harrison would characterize as the "useful rays" it disperses. It is the only lamp in street lighting that does not insist on having, for wide distribution purposes, its rays checked and diverted to the quarters where they are required. The electrical people are prepared to move heaven and earth in order to prevent the fact of the superiority of the inverted gas-lamp getting widely recognized among street-lighting authorities. It will be the fault of gas suppliers if they succeed; but they will leave no stone unturned to do so, even if they have to go to the extent of scurrilous misrepresentation.

Our amiable contemporaries are extremely annoyed with street lighting authorities who take advantage of the best illuminating agent that is at hand when it means the supersession of electric lamps. They get so incensed that they forget the true meaning of terms. Progress is rendered "retrogression" by "Meteor" in the "Electrical Times;" and a matter that should be one for rejoicing and congratulation is spoken of in "Electrical Engineering" as a "regrettable occurrence." This we find is the position of things in our contemporaries over the decision of the Bournemouth Town Council, in modernizing their street lighting, to do so by adopting one of the modern forms of low-pressure gas-lamp rather than one of the most modern forms of electric-lamp, and to cut out altogether the present inefficient system of electric lighting. The particulars were given in the "Journal" for the 9th inst. (p. 135). The Corporation are not effecting the change without experience. For three years, they have been making experiment and observation; and they know what can be done by the modern lamps of both classes. They know of the unreliability and bad distribution of the electric system of lighting, of the inconstancy of the arc lamps (flame and otherwise), of the reliability of the gas system, of the constancy and steadiness of the inverted gas-burner, and of the economy of its maintenance. This is a matter of experience with them; and all the windy puffs of our electrical contemporaries, about the depreciating quality of the gas mantle which

they conjure up in their brains (without explaining in what way the assumed perishing of the mantle occurs), will not upset this experience. The electrical people find it difficult when they get on to the depreciation question to account for the fact that Mr. J. W. Bradley, M.Inst.C.E., the City Engineer of Westminster, and other responsible municipal technical officers, always find the high and low pressure gas-lamps well above the contract lines; and we have no doubt whatever that the Bournemouth Gas Company would not raise any insuperable objection to the suggestion of the writer of the "Electrical Times" as contained in one of his meteoric notes: "Nothing but systematic photometric tests and solid penalties every time the generous 600-candle power is not reached would be good enough for most local authorities; and we trust that the forthcoming contract will include highly desirable provisions to that end." It is a condition applying in the Westminster and certain other street-lighting contracts; and well "Meteor" knows it.

Our friend also thinks that an amazing feature of the affair is the manner in which the Borough Surveyor has been bye-passed. An equally amazing thing is how the Surveyor tried to bye-pass the intelligence of the Borough Council. This gentleman made himself responsible for the statement that, "with regard to gas, of course you understand that the falling off in the lighting in the first 400 to 600 hours is considerable, varying from 40 to 50 per cent." We have no fear, if the Borough Surveyor desires to be impartial in this matter, that he will have occasion to make the *amende honorable* for this public statement in an equally public manner. Talking of bye-passing borough surveyors, we know of more than one borough surveyor who has electric lighting in the streets (which electric lighting has got there through the instrumentality of the electric lighting committee and their engineer, against the opinion, or without seeking the opinion, of the borough surveyor), and who would be very thankful indeed to again have reliable gas lighting as the means of illuminating the streets.

"Meteor" also taunts the Bournemouth Borough Council with having rejected flame arcs of 2000-candle power [we see they have, under his powerful magnifying glass, grown to 3500-candle power since] at £11 5s. per annum in favour of the guaranteed 600-candle power gas-lamps (which in all probability will show, as 600 is the guaranteed figure, some 700 candle power, and perhaps even more) at £5. Now what is the good of "Meteor's" pretence that these are actual 2000 [or 3500] candle power lamps. He knows as well as we do, as all authoritative tests show, that figures of this kind applied to electric arc lamps are only trade distinctions. He knows well that all the testing authorities such as Professor Morris, Professor Sumpner, and many others complain that so erratic are the flame arc lamps that they cannot get constant readings from them, and that such readings as they do get fall far short of the glory of the illuminating ability with which their makers crown them. "Meteor" knows, too, how Mr. Haydn Harrison was the other day expounding in the columns of the "Electrical Times" the doctrine of useful rays as distinguished from the makers' magnificent claims, in which there is a large *plus* quantity of useless and invisible rays. As recently, too, as July 11, Mr. H. T. Wilkinson, in the "Electrical Times," was also saying that, if good light distribution is wanted, it seems obvious that the right way is to distribute the source of light, by using a large number of small units suitably disposed, instead of a small number of large units. According to Mr. Haydn Harrison and Mr. Wilkinson, the Bournemouth Council are on the right lines in not adopting the so-called 2000 [or 3500] candle power flame arcs. According to "Meteor," who is so backward in his knowledge that he speaks of adopting inverted gas-lamps as an act of retrogression, the Council would have done better by adopting the lamps that many experts, electrical and otherwise, state do not live-up to the nominal distinctions that their benevolent producers confer upon them.

The accounts of the Marylebone Borough Council Electricity Department for the past year are not so good as it was hoped they would be. There have been several difficulties. Among other things coal has cost £1000 more; and in the current year it is likely that this item will swell still more. In consequence of adverse circumstances, the profit that it is thought should have been £17,000 was nearly £9000 below this sum, or, in other words, the profit was rather more than £8000. But there was a terrible lot of discussion, at a recent meeting of the Council, as to whether or not the staff of the department should receive a bonus of £518 15s. 7d., which the Committee suggested should be paid to them. There is an agreement in force between the Committee and the staff that, if certain things are accomplished, a bonus shall be paid to the latter. But in the past year the conditions were not fulfilled; so the staff are not legally entitled to a bonus. This was pointed out to the Council when a paragraph relating to the matter in the Committee's report was before them; and the Council then decided not to adopt the paragraph. But later on the Committee presented a resolution, adopting the report and authorizing the payment of the bonus named. This was carried, but only by the casting vote of the Mayor. If any ratepayer or ratepayers thought it worth while to do so, there is little doubt that he or they could bring the Council to book over the matter; or perhaps the Local Government Board Auditor will surcharge those members who voted for the bonus in defiance of the legal conditions of the agreement. If the Council desire to make the conditions of the agreement fit years such as the past one, it is their business to formally alter them, and not to ride roughshod over the conditions just as pleases a majority.

A wanderer on the face of the earth alighted at Cheltenham; and among his acquisitions while in that delightful town was a "Borough" guide to the Metropolitan Borough of St. Marylebone, published "under the auspices of the St. Marylebone Borough Council." This brochure is published in Cheltenham by Ed. J. Burrow; and it may interest the Gaslight and Coke Company to know that the London agents are Percy Lund, Humphries, and Co., Limited, of 3, Amen Corner, E.C. Towards the end of this guide, there appears the advertisement of the Marylebone Electricity Supply Department; and if the Gaslight and Coke Company have not seen it, they may be interested in knowing that one of the paragraphs of the advertisement reads as follows:

> It is *obvious* that the chemical operation of combustion (which takes place in the use of all illuminants except electricity) leaves behind it *poisonous* and *semi-poisonous* gaseous, solid, and oily products of combustion, which are necessarily inhaled by persons in the rooms to the detriment of their health, and the chemical nature of these products is such as will, and does, attack the materials which go to make up decorations, pictures, &c.

The composition of the foregoing is almost as bad as the inaccuracy and trade slander contained in it. In the first place, it appears that something is "obvious" to Mr. Seabrook, Mr. Holmes, or other official of the electricity department of Marylebone that the highest scientific chemical authorities, as well as the person with elementary chemical knowledge and a sufficient analytical ability to carry through a simple test, can tell these electrical commercial partizans is not true, and that to say it is true is an infamous thing. The moving spirits of the Marylebone Electricity Department are not backward with their pens or their tongues when opportunity occurs. We therefore ask Mr. Seabrook, as the chief responsible officer of the department, to inform us what are, in the case of gas combustion, "the poisonous and semi-poisonous gaseous, solid, and oily products of combustion," which are detrimental to health and destructive of property. These things being "obvious" to Mr. Seabrook, he will have no difficulty in readily giving us the information.

A further despicable insinuation is contained in the following sentences:

> Another point which should be brought to the notice of the public is the entire absence of dangerous and unhealthy fumes when electricity is used for heating. An entirely harmless and pure heat is given out, because no chemical action takes place, and there are therefore no poisonous products of combustion let loose into the room to be inhaled by its unsuspecting inmates.

There is something that is perfectly "obvious" here; and it is that the intention of the advertisement is to suggest that there are dangerous and unhealthy fumes from gas-fires, and that poisonous products of combustion are let loose into rooms when gas-fires are used. Again, we challenge Mr. Seabrook to gives us the names of poisonous fumes that are let loose into a room where a gas-fire is used, and to furnish us with the name of the authority upon whom he depends. We are surprised that the members of the Borough Council of Marylebone should allow their Electricity Department to sink to the defamatory level revealed by the department's advertisements in this guide-book for the purpose of cultivating new business. There might be an excuse for a small country authority composed of ignorant, illiterate men; but we look for something better from the members of the Borough Council of Marylebone.

Another dreary account for the ratepayers of Faversham as the result of the working of the electricity department for the year ending March 31, 1912! The ratepayers have to find a further £1104 to make this wicked example of local authority speculation meet its financial obligations. The ratepayers have had to contribute no less than £8529 to meet deficiencies since the formation of the concern—a concern on which £24,179 of capital has been received, but of which only £4888 has been repaid, notwithstanding the £8529 taken from the ratepayers to compensate losses. No sinking fund and no reserve fund have been established. The concern was floated, the capital mentioned raised and expended, and yet all the business the undertaking can do is represented by £1173 from private consumers and £730 from the public lamps. The private business alone is only just about equal to the £1104 which the Council are obliged to get from the ratepayers. If the £1104 and the amount paid for public lighting (£730) are added together, the ratepayers will see they have cause for weeping rather than rejoicing over the foolish possession. For what amount of consolation they can get from it, they have our sympathy over the burden they have to bear, and over the deception which made them the victims of this piece of administrative folly.

Captain William Bealey Harrison, of Aldershaw, Lichfield, Chairman and Managing-Director of Messrs. John Russell and Co., and head of the firm of Messrs. William Harrison, of Brownhills Colliery, who died on the 23rd of March last, aged 74, left estate of the gross value of £200,820, with net personalty amounting to £133,731.

The Institution of Mechanical Engineers meet next week in Belfast (Tuesday and Wednesday); but no papers of special concern to the gas profession are to be read. The one perhaps of most interest is by Mr. H. V. Pegg, who will deal with the "Commercial Utilization of Peat for Power Purposes." After that a paper by Mr. Daniel Adamson may be mentioned. He will treat of "Wire Ropes for Lifting Appliances and the Conditions that Affect their Durability."

DUTCH GAS MANAGERS' ASSOCIATION.

General Meeting at Arnheim.

THE Fortieth General Meeting of the Association of Gas Managers of Holland was held at Arnheim, on June 9 and 10, under the presidency of Heer O. S. KNOTTNERUS, of Rotterdam. The following is a summarized report of the proceedings.

WELCOME BY THE BURGOMASTER.

The members assembled on the evening of the 8th ult., and were very cordially welcomed by the Burgomaster of Arnheim. Thanks for the reception and welcome were returned, on behalf of the Association, by the President.

ADDRESS BY THE PRESIDENT.

The business proceedings commenced with an opening address by the President, at the outset of which he referred to the losses the Association had sustained during the past year by the death of three members, and also to the Jubilees of some others. The number of members of all classes amounts to 353. He then congratulated Heer J. Rutten on his invention of the safety gas-meter.

Reviewing the year's progress of the gas industry, the President said it was very agreeable to him to mention the fact that, notwithstanding the rapid growth of electricity works in Holland, the production of gas had made great progress. Everywhere new works were being erected, and those already existing enlarged; or little communities were being provided with gas from the larger places in the neighbourhood—in this respect following the example of Heer von Doesburg, of Leyden. The total output of gas in Holland in 1911 was 400 million cubic metres (14,127 million cubic feet); showing an increase of 4 per cent. compared with the preceding year.

The most important event of the year was the coal strike in England, which brought great difficulties for Dutch gas managers, especially as in Germany the position was becoming more and more serious. It must be said, to the credit of the gas industry of Holland, that it came very well through the trial, for nowhere did the production of gas fall short. The strike showed clearly the difficult position in which Holland is placed in such emergencies, as she is not a coal-producer; and therefore the boards of directors of gas undertakings had made up their minds to present a petition to the Government, in order to insist on a more rapid development of the coal mines of the country, notably those of Limburg, where gas coals are found in sufficient quantity to provide the whole of Holland with them.

With regard to the improvements effected in the gas industry, vertical retorts and chamber settings attracted most of the attention of the gas managers of Holland. Arnheim, den Haag, and Tilburg led the way—Arnheim with vertical retorts, Tilburg and den Haag with chamber settings.

In concluding his address, the President pointed out how the competition with electricity necessitated a strong propaganda on behalf of the gas industry—much stronger, indeed, than had hitherto been employed. Various means were, he said, at the disposal of gas managers, among which he mentioned first the delivery of lectures on the application of gas for domestic purposes as was done in other countries; and next the holding of further exhibitions, such as those which had been already held in Zeist and Doesburg. But above all was good street lighting, which was always looked upon as the best means of advertising the gas industry; and he requested his colleagues not to rest satisfied until not only the street lighting, but also the lighting of private houses, was as good as circumstances allowed.

GENERAL BUSINESS.

The meeting then proceeded to elect, by acclamation, Heer Brender à Brandis, Manager of the Antwerp station of the Imperial Continental Gas Association, an honorary member of the Association. The election of officers for the year 1913 also took place. Heer P. Bolsius (Bois-le-Duc) was chosen as President; Heer O. S. Knottnerus (Rotterdam), Vice-President; and Heer N. Niermeier (Arnheim) and Heer M. Levert (Apeldoorn), were elected members.

The reports of the Committees on photometry, the establishment of standard methods of examining gas oils, and the archives and library of the Association were taken. Summaries of the content of these reports, so far as they are of general interest, are given below.

Various sums were voted for furthering the work of the Technical Committees of the Association, for defraying the expenses of the general meeting, for the staff of the journal "Het Gas," of which Heer Bolsius was re-elected Editor, and for publishing the annual statistics of Dutch gas-works.

The report of the Coal Committee was not ready at the opening of the meeting, as the questions sent to the members were not answered in time. In this connection, Heer Baudouin remarked how difficult the position of the Committee had been at the time of the coal strike; and he said it was only by all the members of the Association joining hands that it would be possible to make the Committee as strong as it ought to be. A further matter of importance was the appointment of a Committee to take the preliminary steps for the establishment of a laboratory, where small gas undertakings not in possession of one of their own could have investigated all kinds of questions relating to the production and distribution of gas, and the various residual products analyzed.

PAPERS AND DISCUSSION.

The papers submitted were then read. The first was by Heer Meier Cluwen, of Arnheim, on "The Vertical Retorts of the Arnheim Gas-Works;" and the next by Heer J. Rutten, on "Improvements in the Safety Gas-Meter, especially in Meters used in Hotels and similar places."

Heer C. J. Snyders, of The Hague, read a paper on "Producing Sulphate of Ammonia in a Closed Saturator," in which apparatus the sulphate is carried up by steam. In the first place, the author mentioned that with the old system the sulphate could only be removed from a neutral or ammoniacal solution, in which case a loss of ammonia always occurred. By working with a closed saturator, the sulphate could be removed in an acid liquor by means of steam. The liquor had always a specific gravity of nearly 35° Baumé. The saturator could not get dirty, and nothing could fall into it, because it was closed. The sulphate produced in this way contained more free sulphuric acid than the sulphate produced in an open saturator. This, however, was of no consequence in respect of its use in agriculture.

Heer van Mierls, of Tilburg, followed with a paper on "The Results obtained with Chamber Settings during the Past Half Year." Before he decided on adopting chamber settings, the author had made comparisons between them and vertical settings. The latter were guaranteed as follows: 1000 kilos. of coal were to produce 310 cubic metres of gas of 5400 calorific power per cubic metre; and the brickwork was guaranteed to last 500 days at a temperature of 1400° C. The chamber settings were to produce, per 1000 kilos. of coal, 340 cubic metres of gas of 5000 calorific power; and the brickwork was guaranteed to last 1000 days at a temperature of 1200° C. For the vertical settings, the author would have had to pay 28,400 fl. more than for chamber settings of nearly the same production; and so he decided to have the latter. With these settings it was not necessary to work at night. Only one man went to work in the evening, and he remained till the next morning. The results in the preceding six months were as follows: 1000 kilos. of coal produced 335 cubic metres of gas of 5300 calorific power, 45·5 kilos. of tar, and 11·7 kilos. of sulphate of ammonia; and 145 kilos of coke were used for heating purposes. The author got nearly 4s. for 100 kilos. of his tar. The gas produced contained 2 per cent. of carbonic acid; and there was not so much naphthalene in the mains as before.

Heer Bakhuis, of The Hague, confirmed these results.

Other matters were the subjects of discussion; but only those of general interest need be mentioned here.

In the first place, several managers related how they had produced all the gas that was required when the miners' strike in England broke out and the supply of coal was suddenly withdrawn. Most of them had used gas oil—putting it into the retorts; but one mixed peat with the oil. Another carbonized old timber, and produced per 1000 kilos. 325 cubic metres of gas, of which he did not know the composition. In most of the larger gas-works, the proportion of water gas was increased.

On the subject of apparatus for the automatic lighting of gas-lamps by an increase of pressure, Heer Baudouin, of Maesdricht, said he had placed a small holder in the main, near the governor, in order to prevent a sudden increase of pressure in the main caused by the wind upon the holder. During a period of severe cold last winter there was no complaint of stagnation in the mains supplying the high-pressure gas-lamps. Heeren Ochsendorf, Bruinwold, Riedel, and Muller stated that they had not had any good results with the low-pressure mercury gas-lamp of Halbmayer, of Vienna. An engineer connected with this firm read a paper upon the subject, and promised some improvements in the lamp.

Rotterdam was chosen for next year's general meeting. A visit was paid to the Armheim Gas-Works at the close of the first day; and a boat trip on the Rhine and the official banquet concluded the meeting.

REPORTS OF COMMITTEES.

Photometry Committee.

The business of the Committee during the past year consisted in the verification of the "London" argand No. 1 burner, modified as was determined in the report of 1906. Comparative tests were made with some Methven screens. In comparison with the ten-candle pentane lamp, it was found that these burners gave from 2 to 2·23 English candles. A modified Junkers calorimeter was tested, and a comparison made with it of the "Sarco" self-registering calorimeter. It was found that the former instrument gave in all respects exact results.

Testing of Gas Oils.

At the conclusion of last year's report of this Committee, it was mentioned that they had still to trace whether, from the calorific value of, and the proportion of hydrogen in, the oils, data would be obtainable for the rapid testing of different descriptions of gas oils. This investigation was made by Dr. Stoffel, and it is the opinion of the Committee that these figures show that a higher

calorific value and a larger proportion of hydrogen indicate a better quality of the oil.

	Carbon. Per Cent.	Hydrogen. Per Cent.	Calorific Value. W.E.	Specific Gravity.
Oil from Galicia	86·36	13·09	10,712	·841
,, ,, Texas	86·85	12·85	10,620	·879
,, ,, Oklahoma	86·02	12·80	10,710	·859
,, ,, Roumania	87·20	12·79	10,645	·874
German export oil	86·30	12·31	10,683	·879
Crude oil from Argentina	87·70	11·72	10,245	·938
Residue ,, ,,	85·40	11·37	10,549	·933
Astra Romana	86·80	11·32	10,120	·956

It is now the opinion of the Committee that the question has still to be answered whether the exactness of both determinations will allow samples of oil of different quality to be distinguished. To this end, the necessary investigations will be made at The Hague, Rotterdam, Amsterdam, and Utrecht; and the results will be given in the next report.

POTTERTON'S "SEALED" GAS-OVEN.

Further Tests—Low Gas Consumptions.

A GREAT deal of interest was aroused at the end of March last by the publication in our columns of the description of, and record of tests carried out in, the new gas-oven designed by Mr. Thomas Potterton, of Cavendish Works, Balham, S.W.; and that interest was subsequently intensified by the examples shown of the early forms of the oven at the Smoke Abatement Exhibition, and the Ideal Home Exhibition. It will be remembered that the main feature of the oven is that the gas-jets are placed in chambers at the sides of the bottom of the oven, and heating is accomplished by means of the space formed between the inner lining of the oven and the outer casing. Baffling devices are employed, so as to ensure the heat travelling to all parts of the oven; but under normal circumstances, through this mode of heat distribution, a higher temperature is obtained at the bottom of the oven than at the top. The method of use in some of the baking operations is, therefore, to first place the food at the bottom, and then to transfer it to the shelves above. Beside the removal of the gas-jets from the interior of the oven, the low gas consumption is yet another feature. This is shown in some fresh tests that have been made, and which confirm those previously published. This low gas consumption, of course, means very moderate costs.

These fresh tests were conducted in the No. 1 size oven, the cooking space in which is 20 in. high, 13¾ in. wide, and 13 in. deep. The first two tests were made by a well-known expert lady cook to test the efficiency of the oven for bread, cake, and pastry baking. From the tests, it will be observed that only 18½ cubic feet of gas were consumed from lighting-up to the completion of the baking of three 2-lb. loaves of bread, and a further 11½ cubic feet sufficed for the baking of 24 rock cakes and 24 sundry pastries—less than a pennyworth of gas at 2s. 6d. per 1000 cubic feet for all the work.

BREAD BAKING (Three 2-lb. Loaves).

	Time.	Gas Used. Cub. Ft.	Results.
Gas lighted	10.40	—	—
	11.6	7	Bread put in oven. One loaf on top grid. ,, ,, ,, centre grid. ,, ,, ,, bottom of oven.
	11.33	14	Top and middle loaves reversed.
	11.50	18½	Bread taken out.

ROCK CAKES AND PASTRY BAKING (24 Rock Cakes, 24 Sundry Pastries. Seven tins used).

	Time.	Results.
Continuing	11.55	Five tins in oven—Rock cakes. ,, ,, Pastries. Rock cakes.
	12.5	,, ,, Rock cakes from lower grid put on top grid. The cakes from top grid put at bottom of oven.
	12.10	Pastry taken out.
	12.15	Two tins of rock cakes taken out. Two tins of pastries put in oven.
	12.20	Two tins of rock cakes taken out.
	12.35	Pastries taken out.

Gas used for pastry cooking, 11½ cubic feet.

The second set of tests were made at the Cavendish Works, Balham, between the hours of 9 o'clock and 1 o'clock one day when some half-dozen gas company fitters were at the works studying the details of water-heated boilers, as well as the efficiency of the new oven. It will be noticed from the times registered that the work was done continuously. Bread, pastry, tarts, and beef and vegetables were baked; and only 52½ cubic feet of gas were used for the whole lot, which, at the local price of 2s. 2d., cost less than 1½d. Temperatures were taken during the bread baking; but it was impossible to conveniently find room for the thermometers during the baking of the other food. The results were as follows:—

June 19, 1912 (Gas Pressure, 32-10ths).

BREAD BAKING (Three 2-lb. Loaves).

	Time.	Gas Used Cub. Ft.	Results.	Temperature in Oven. Deg. Fahr.
Gas lighted	8.55	—	—	---
	9.20	7	Bread put into oven One loaf on top grid ,, ,, ,, centre ,, ,, ,, ,, bottom ,,	390
	9.45	13	Top and middle loaves reversed	
	10.5	18½	Bread taken out	510

PASTRY BAKING (Two Jam Sponges, Nine Tartlets, One Open Jam Tart).

Continuing	10.10	—	Food put in oven
	10.18	22½	Two sandwiches, Nine tartlets } taken out Pastry at bottom transferred to higher shelf
	10.24	24	Pastry taken out

TART BAKING (Cherry and Gooseberry Tarts).

Continuing	10.25	—	Tarts put into oven. One on middle shelf. One on top shelf. Bottom of oven empty.
	11.0	34	Tarts taken out.

BEEF AND VEGETABLE COOKING (9 lbs. Rolled Ribs of Beef, Batter and Rice Puddings).

Continuing	11.4	—	Food put into oven. Rice pudding on top shelf. Beef suspended from hook.
	11.5	35	—
	11.20	—	Gas reduced to 7½ cubic feet per hour.
	12.15	46	Rice pudding taken out. Batter pudding put in bottom of oven.
	1.0	52½	(Total) Meat and pudding taken out.

So much baking work costing so little for fuel is a really notable record.

AMERICAN CENTENARY CELEBRATION LECTURES.

WE have received from Mr. George G. Ramsdell, the Secretary of the American Gas Institute, the volume of lectures delivered at the Centenary Celebration of the First Commercial Gas Company, held in the Franklin Institute, Philadelphia (Pa.), on the 18th and 19th of April. The principal portions of the lectures have already been published in the "JOURNAL," and their merits discussed; but it may be of interest to give their titles and the names of the authors:

"Bye-Products in Gas Manufacture," by Charles E. Munroe, Ph.D., Professor of Chemistry and Dean of the School of Graduate Studies in the George Washington University.

"The Commercial and Financial Aspects of the Gas Industry," by the Hon. George B. Cortelyou, President of the Consolidated Gas Company of New York.

"The Technique of Gas Manufacture," by Alfred E. Forstall, M.E., Secretary of the Trustees of the Gas Educational Fund of the American Gas Institute, and Past-Secretary of the American Gaslight Association.

"Gas as an Illuminant," by Van Rensselaer Lansingh, B.S., President of the Illuminating Engineering Society.

"The Use of Gas for Heat and Power, and the Testing of Gas," by Edward B. Rosa, Ph.D., Chief Physicist in the United States Bureau of Standards, Washington (D.C.).

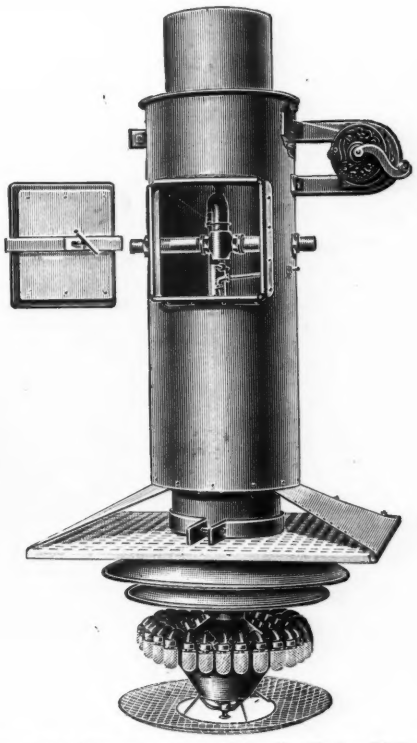
In a note by the Editor, it is explained that the original intention to publish the lectures in the American "Gas Institute News" was abandoned in favour of issuing them in book form. It was considered that if each of the lectures was given separately, much value contained in the surroundings would be lacking to comprise a symposium of complete historical worth. The lectures were deemed to be of such importance that it seemed necessary to embrace other features which formed a very large part of the interesting celebration; and by somewhat enlarging the original intention, and including the unique and valuable *ensemble* of articles contained in the loan exhibit, as well as other items incident thereto, it was thought possible to give the celebration a more appropriate place in gas history. The volume consists of 174 pages, and there are 46 illustrations, including a portrait of each lecturer. The contents include the interesting chronology of the early development of gas lighting, by Mr. W. R. Morgan, of San Francisco, which was given in "Gas Institute News" for April, and reproduced in the "JOURNAL" shortly after. The price of the book, bound in full cloth, is $2; and copies can be had from the American Gas Institute, No. 29, West Thirty-Ninth Street, New York City.

PURE AIR IN PLACES OF PUBLIC ASSEMBLY.

The "Nonpareil" Ventilating Gas Sun-Burner.

In places of public assembly, there is no occasion to adopt mechanical arrangements to secure good ventilation. It is, of course, necessary if the electric light is employed; but if a means of lighting by gas is adopted that performs the same ventilating function by purely natural means, so much the better from all points of view. Capital expenditure on mechanical ventilation is saved by the installation of such means of lighting, running expenditure is saved, and so are the wear and tear costs. Thus there is economy in a means of ventilation secured by a natural force produced by the lighting arrangement. Moreover, it is a silent means of exhausting the air polluted by respiration, and of causing a more rapid circulation of the pure air drawn in from the exterior. Where people assemble in numbers, it cannot be gainsaid that good ventilation is as important for sanitary considerations as good lighting for the purpose of vision and safety. The "Nonpareil"

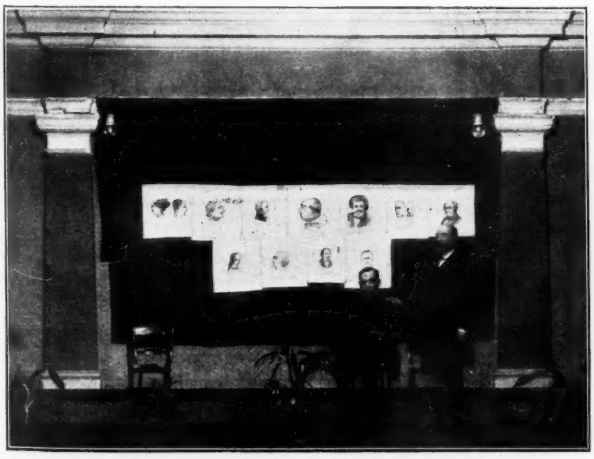
The "Nonpareil" Sun-Burner.



The "Nonpareil" Burner and Part of the Ventilating Fitting.

inverted incandescent gas sun-burner made by Messrs. J. Milne and Son, Limited, provides not only a good white light penetrating all parts within its range of a theatre, hall, church, or other place of assembly, but also an efficient means of ventilation. This has been proved extensively in the North of England and in Scotland; and now the London branch of the firm (whose offices are at No. 59, Farringdon Road, E.C.) is desirous of seeing the burner largely adopted in the South of England, and adopted on its merits.

When installed, the effectiveness of the arrangement, both from the lighting and ventilating standpoints, has already been demonstrated in various places. A sample has been fitted up at the Horseferry Road offices of the Gaslight and Coke Company; and installations have been effected at the Ramsgate Pavilion, the Hythe Institute, the Hereford School, the Exeter Public Hall, the Derby Law Courts, and the Northampton Gas Company's show-rooms. The installation at Ramsgate is very interesting. Electric light was formerly in use there; but the electric light has had to give place to the "Nonpareil" ventilating sun-burner.



Photograph Taken in the Hythe Institute by the Light of a "Nonpareil" Burner, to Show the Excellence of the Illumination.

In the days of the electric-light, visitors to the pavilion could only smoke in the galleries during the performances, owing to the fact that, if smoking were allowed in the body of the hall, the place became charged with a cloud of smoke whose opacity was detrimental to the full enjoyment of the "turns" on the stage. The trouble led to the installation of the "Nonpareil" ventilating sun-burner; and there was an immediate cure. Now smoking can be indulged in all over the body of the hall, and no one is the slightest inconvenienced, while the light is steady, and excellent in its effect.

The "Nonpareil" arrangement is constructed of various sizes, fitted with 9, 16, or 28 inverted burners; the higher the number, the greater, of course, the heat, and consequently the stronger the draught created. Each burner is properly adjusted to the quality of gas and pressure; and it may be taken that, at 2 inches pressure, and with the quality of gas generally found in the South of England, the consumption per burner is approximately 2·8 cubic feet. Both the gas and air are pre-heated before entering the bunsens; and thus perfect admixture and combustion are secured. The illuminating duty is placed at 2100 candles for the 28-light burner, 1200 candles for the 16-light burner, and 675 candles for the 9-light burner. The efficiency is equal to about 27 candles per cubic foot of gas consumed. The inverted burner has made this type of ventilating sun-burner possible, as the upright type could never have been adapted to this purpose with the same degree of lighting efficiency or economy in mantles. Halls can be pointed to where the arrangement has been in use six months, without a single mantle renewal. For cleaning and mantle replacement, the burner part can be lowered and raised by means of a wire-rope and a winch situated anywhere in the hall; junction of the burner with the gas supply being made by a ground-in joint. Another advantage is that the burner is fitted with a by-pass; and the main cock controlling it can be fixed at the back of the stage or in any other part of the building, so that the light can be readily extinguished during the acts if necessary, and promptly relighted.

The shaft above the burner is simply connected with a duct leading to the outside of the building; and the arrangement can be fitted with any casing suitable to the roof. The burner, too, can be fixed close to the roof, or hung 2 to 30 feet below; it is all a matter of choice and convenience. Therefore, besides its dual efficiency as a ventilating and lighting agent, the arrangement is accommodating, and not exacting as to the conditions to which it shall be applied.

Visit of Technical Societies to Cornwall.

Between sixty and seventy representatives of some fourteen scientific and technical societies and of various universities and institutions, visited Cornwall last week by invitation of a local Joint Scientific Reception Committee, of which the Right Hon. Lord St. Levan was the President. The Societies represented included the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Iron and Steel Institute, the Society of Chemical Industry, the Chemical Society, as well as the Royal Society, and the various Mining Institutions. Visits were paid to a number of tin mines, to china-clay pits and works, safety-fuse factories, rock-drill and pumping and ventilating machinery works, and the pitchblende or "radium" mine near St. Ives. At some of the mines there are modern installations of Diesel oil-engines and of Westinghouse gas-engines in units of 140 H.P. A valuable account of the industries of Cornwall had been prepared by Mr. E. W. Newton, F.G.S., on behalf of the Reception Committee for the use of the visitors. Among the latter, names which will be familiar to readers of the "Journal" are: Mr. W. J. A. Butterfield, Professor John Cadman, Mr. G. Nevill Huntly, and Professors W. R. E. Hodgkinson and H. Louis. The visit extended from the 15th inst. to Saturday last.

ALKALI WORKS CHIEF INSPECTOR'S REPORT.

THE Forty-Eighth Annual Report (for 1911) of the Chief Inspector under the Alkali Works Regulation Act, 1906 (Mr. W. S. Curphey), was issued yesterday. It is followed, as usual, by the reports of the various District Inspectors, and by the report presented to the Secretary for Scotland; the latter giving details of the work done by Mr. J. W. Young, B.A., B.Sc., who succeeded Mr. Curphey in the supervision of this district.

In opening his report, Mr. Curphey states that the number of works in England, Ireland, and Wales registered under the Act was 1296, in 74 of which salt was decomposed with evolution of muriatic acid and requiring registration under the definition of "alkali works." In the remainder, operations were carried on which called for registration under section 8 or as one or more of the works enumerated in the first schedule of the Act. There was thus an increase of four premises registered as alkali works and an increase of 26 otherwise registered, as compared with 1910; the total increase being 30. There were also 167 works in Scotland registered under the Act; making in all an aggregate of 1463 for the United Kingdom. The number of visits to works last year was 6116, and of tests made 6297. The general average amounts of acid gases escaping from the exits for waste gases in works under inspection show slight variations from the preceding year. The acidity of gases of all chimneys was equivalent to 1·192 grains of sulphuric anhydride per cubic foot, compared with 1·247 grains during 1910. This reduction is a continuation of the improvement noted in the report for 1910, and is not due to any outstanding feature. Of the 6297 tests made, a very small proportion were found in excess of the limits prescribed.

With regard to sulphate and muriate of ammonia works, Mr. Curphey reports that the number of processes under inspection last year was 626, or 26 more than in 1910. This increase was associated with a further augmented production of this most important residual product. Through the courtesy of manufacturers, he is enabled to continue to present figures showing the quantity of ammonia (expressed in terms of sulphate) recovered in the United Kingdom as a bye-product from the various industries indicated in the following table :—

—	1911.	1910.	1909.
	Tons.	Tons.	Tons.
Gas-works	168,783	167,820	164,276
Iron-works	20,121	20,139	20,228
Shale-works	60,765	59,113	57,048
Coke-oven works	105,343	92,665	82,886
Producer-gas and carbonizing works (bone and coal)	29,964	27,850	24,705
Total	384,976	367,587	349,143

The aggregate increase over 1910 is 17,389 tons. Mr. Curphey points out that this increase is slightly less than the corresponding figure of 18,444 tons recorded for that year compared with 1909; but the influence of unrest in the labour world which retarded advance in 1910 continued, he says, to have a similar influence throughout 1911, especially as regards the extension of recovery plant in connection with coke-ovens.

The method of removing ammonia from crude gases by submitting these to the action of sulphuric acid, without in the first place forming an ammoniacal liquor, now known as the "direct" process, was brought into further use during the year, but not to the extent which might have been anticipated. In the case of coke-oven works, one cause is indicated above. In the case of gas-works, many considerations have to be weighed before deciding upon what type of plant, if any, should be adopted; so that it is perhaps not unnatural that there should be a tendency to wait for further accumulation of experience with regard to the new method. The readiness with which ammonia escapes from ammoniacal liquor is an important point to consider in this connection. This tendency of ammonia was referred to in the report for last year; but Mr. Curphey cannot refrain from again mentioning it, as during the heat of last summer there were many cases where large losses of ammonia occurred. In one case the ammoniacal liquor had become so weak that on distillation it failed to form a solid salt in the saturator when operated on in the ordinary way.

The figures show an increase from every source of supply save from iron-works, where the trifling reduction of 18 tons has to be recorded. This contribution to the general production is furnished by those iron-smelting works in which coal is the sole or the chief fuel used in the blast-furnaces. This custom is largely confined to Scotland, where it is general. In districts where the character of the coal at command renders it desirable to use coke in the blast-furnaces for iron-smelting, the problem of ammonia recovery is transferred from blast-furnace gases to the gases driven off the coal in the coke-ovens during the process of making coke.

The largest industrial source of sulphate of ammonia is still the widely distributed and important manufacture of illuminating gas from coal; but the relative proportion as compared with the total production is becoming less, owing partly to advances in methods of gas manufacture, which permit of a greatly increased production of gas per ton of coal carbonized, and partly to the rapid growth of the more recent processes for the recovery of bye-products from coke-oven gases, and from producer gas.

This portion of the report is followed by some extensive and important remarks on the recovery of ammonia from crude gases. Some extracts from these are given later on; and they will be dealt with further in a subsequent issue.

Referring to tar-works, Mr. Curphey says there were 163 of these works registered last year—an increase of nine compared with 1910. In all cases noxious gases evolved in the process of distillation were efficiently dealt with, either by combustion under proper safeguards or by absorption in purifiers charged with lime or oxide of iron, or a combination of these two agents. The increased number of tar-works under inspection is stated to be in large measure due to the installation in gas-works of plant for the production of prepared or boiled tar in order to meet the widely spread demand for a tar suitable for road making. For this purpose, it is sufficient to remove the ammoniacal water always present in crude tar along with the more volatile tar oils. The distillation need not proceed far in such cases; and after the condensation of the ammoniacal water and light oils removed from the tar, the remaining waste gases are readily dealt with by purifier or by combustion.

Mr. Curphey says it is satisfactory that the practice adopted by some of using crude gas tar for road surfacing is being departed from. The use of crude tar for such purpose leads to the products just referred to as being condensed in tar-works (and which are subsequently utilized) being discharged into the air, to the prejudice of the neighbourhood when the crude tar is sufficiently heated at the roadside prior to use. If the crude tar be not sufficiently heated before use, part of the ammoniacal water and naphtha will remain in it, whence they may be removed by weathering, to the possible detriment of local drainage and probable injury to the road surface through deterioration of imperfectly prepared tar.

RECOVERY OF AMMONIA FROM CRUDE GASES.

A LARGE portion of the Forty-Eighth Annual Report of the Chief Inspector under the Alkali Works Regulation Act, 1906 (Mr. W. S. Curphey), issued yesterday, was devoted to the above subject. We extract this part, leaving till next week a general notice of the remainder.

During the past year, much attention was attracted to methods by which ammonia present in crude gas, either from the gas-retort or from the coke-oven, could be obtained in the form of a solid salt fit for sale, but without the necessity of providing sulphuric acid as is the case at present in all works producing sulphate of ammonia. Progress has been made towards this goal; but up to the end of the year, practical results within the United Kingdom were not sufficiently advanced to permit of any definite report being made on a proposition which is at once attractive and hopeful—attractive, because of the utilization of that most noxious constituent of the crude gas, sulphuretted hydrogen, in place of the sulphuric acid now required; hopeful, because of the favourable accounts which have been given of the successful operation of one of these processes abroad.

No material change has to be noted in the methods of dealing with the waste gases evolved when distilling ammoniacal liquor from gas-works. As in past years, these waste gases have been dealt with by a variety of methods. Part were burned for use in the manufacture of sulphuric acid, part were decomposed in the Claus kiln for the recovery of sulphur, part were destroyed by combustion (the resulting sulphurous acid being arrested in wash-towers packed with limestone), part were purified by the formation of metallic sulphides, and part were absorbed in oxide of iron purifiers. Of these methods, the oxide of iron purifier is that which is most widely and most frequently used. Continued experience confirms the opinion that the heap form of purifier has advantages over the older forms of box or walled purifiers, and that the low, broad-based heap is to be preferred to the high, conical heap with comparatively restricted base.

The behaviour of oxide of iron in these purifiers varies greatly. This variation has an immediate bearing upon the efficiency of the purifier and the cost of upkeep. It is desirable, therefore, to elicit, if possible, some at least of those factors which influence for good or for evil the action of the oxide used in the purifiers attached to plant for the manufacture of sulphate of ammonia.

It is a matter for regret that an analysis of the data relating to many works kindly supplied by the owners and managers failed to afford any clue to the cause of the formation of soured oxide. The temperature of an oxide purifier is affected by other factors, such as moisture, &c., which were not included in the data available for consideration. Actual temperature records are necessary, with analysis of the products formed, before the conditions which favour souring can be fully recognized.

An investigation by laboratory experiments was also undertaken and carried forward in the limited time available so far as is described in the following text.

In applying the results of laboratory experiment to actual working, the widely different conditions existing between experiment and practice must not be forgotten; but the results so far attained point to the desirability of more accurate knowledge of the conditions existing in purifiers when these are in operation—

as regards temperature, both during the sulphiding and the revivifying stages, the proportion of moisture, the proportion of air added to the waste gases when concurrent revivification is practised, and the proper distribution of the waste gases throughout the mass of purifying material. The sufficient cooling of the waste gases before these reach the purifier is likewise most important.

It may be well to emphasize the detail that, in those laboratory experiments showing the beneficial influence of a large proportion of air, the temperature conditions were largely under control. But even so, the flow of the mixed gases required to be moderated to prevent undue rise of temperature. On the large scale, of course, the passage of such a mixture through an oxide of iron purifier would be impracticable under ordinary working conditions.

Too long a passage of the waste gases through one purifier causes an accumulation of sulphided material, which is likely to lead to unduly high temperatures if revivified *in situ*. There are distinct advantages in alternating purifiers at suitable intervals, instead of continuing one in use until the contents are incapable of further efficient work. Much better results may be anticipated from several moderate sized purifiers used in rotation, with an opportunity for dissipation of the heat developed during sulphiding and revivification, than from two large purifiers of corresponding capacity each working for a lengthened period and with but limited opportunity for getting rid of the heat generated by chemical action.

The revivification *in situ* by a current of air travelling in the same direction as did the waste gases during sulphiding, has the disadvantage of removing a maximum of moisture from the zone of oxidation. Since reaction arises near the point of inlet for the air, this becomes heated, and the residual gases pass onwards warmed and ready to absorb moisture until saturated at the higher temperature. The tendency is thus to bring about conditions adverse to that hydration which appears essential for efficient revivification.

No definite cause has been recognized to account for the occurrence of "souring" being more frequent in Scotland than elsewhere. It may be associated with the observation of Gedel—that with gases of an acid character the reactions in the oxide of iron purifier differ from those taking place when the gases are faintly ammoniacal. This difference in behaviour has also a bearing on the comparison of oxide purification for waste gases from sulphate of ammonia plants with oxide purification of coal gas. It may also be of practical importance in those numerous cases where oxide, already partially exhausted in gas purification, is transferred for finishing in purifiers connected with the sulphate of ammonia plant, or where oxide previously used in the sulphate purifiers is applied to gas purification.

Oxide of Iron Purification in Sulphate of Ammonia Works.

"Souring" of Oxide.

It is a common practice in works where ammoniacal liquors are distilled for the manufacture of sulphate of ammonia to pass the crude gases from the saturator through a bed of oxide of iron before discharge into the atmosphere to remove sulphuretted hydrogen. After fouling, the oxide is thrown out to revivify by exposure to the air, and is then returned to the purifier for further use, the process of alternate sulphiding and re-oxidation being repeated until the material becomes too inactive for further use as an absorber of sulphuretted hydrogen. In certain works, it is the practice to prolong the life of the oxide by means of air, either admitted to the purifier concurrently with the foul gases during sulphiding operations, or intermittently when the purifier is idle.

The method of working oxide purifiers varies widely in the works under inspection, and no common standard exists with which to compare the results obtained at one works with those obtained in another with respect to the life of the oxide and cost of working. This necessarily follows from the fact that oxide of iron material employed for purification varies widely in character; local circumstances favouring the use of one material rather than another. The proportion of sulphuretted hydrogen in the waste gases depends, further, upon the class of liquor distilled; and the rate of working of the sulphate plant is often governed by conditions independent of the process of manufacture itself. Finally, it is customary in many works to combine the purification process in the sulphate plant with that carried on in the coal-gas plant in such a way that revivified material from the purifiers in the one plant is transferred to the purifiers in the other to be brought up to its full strength before removal for utilization of the recovered sulphur elsewhere. Generally speaking, however, it may be said that no difficulty is experienced in effecting the complete removal of sulphuretted hydrogen from the saturator gases when condensing appliances are adequate and the gases properly distributed beneath a sufficient bed of oxide. Nor, in general, does the re-oxidation of the sulphided material offer any difficulty when proper care is taken to guard against an undue rise of temperature on exposure to air.

In certain works, however, situated for the most part in Scotland, considerable trouble is experienced from the oxide assuming a condition which is characterized by extreme sluggishness or inactivity; the material being very inert with respect to sulphuretted hydrogen, and at the same time showing little or no tendency to revivify on exposure to air. When such is the case, the oxide is found to exhibit an acid reaction and to contain a considerable amount of ferrous sulphate. It is then said to be "sour." It is possible to restore the activity of the material, either wholly or in part, by treatment with milk of lime, ammoniacal liquor, or a solution of soda ash. But managers are often reluctant to employ such means; and, indeed, there are obvious disadvantages attending the use of fixed alkali where the oxide is subsequently burnt as a source of sulphur dioxide in sulphuric acid making. It has to be remembered, also, that free alkali in the oxide is undesirable when cyanogen is present in the waste gases, as it promotes the formation of ferrocyanide and prussian blue upon the surface of the oxide particles. The cause of "souring," however, is so obscure that a comparison of the method of working in use where the "souring" trouble is chronic with that existing in other works where no difficulty is met with has hitherto failed to yield any data from which to draw reliable conclusions. It seemed desirable, therefore, to extend the scope of the inquiry so as to embrace not only a consideration of all the facts relating to the use of oxide of iron material in the sulphate works, but to study, also, in the laboratory the behaviour of similar material under conditions capable of exact control. The inquiry has proved to be a much more lengthy one than was anticipated, and the work is still far from complete. It may be of interest, however, if the results obtained are submitted for consideration, as the facts already ascertained indicate that in many works closer attention to the working of sulphate purifiers would greatly increase their efficiency by prolonging the life of the oxide.

Historical Résumé.

So far as can be ascertained, there has been no systematic research on the working of oxide purifiers in sulphate of ammonia works. This is a significant fact when it is remembered that in the United Kingdom the manufacture of sulphate and muriate of ammonia is now carried on at 676 works, in the majority of which the saturator gases are dealt with by absorption in oxide of iron. The situation is somewhat different with respect to the working of coal-gas purifiers; the purification process in gas-works having been studied by various workers both in the works and in the laboratory, and the conditions for maximum efficiency being now generally known, though procedure varies somewhat at different works. Compared with the operation of the coal-gas plant, the sulphate purifier is a rough-and-ready piece of apparatus for effecting the removal of sulphuretted hydrogen. In the gas-works, crude coal gas charged with 0·6 to 1·8 per cent. of sulphuretted hydrogen is delivered in a steady stream to a set of purifiers worked in rotation, with the admission of a small proportion of oxygen or air (not exceeding 2½ volumes of air to 1 of H_2S) in cases where concurrent revivification is practised; adventitious air, also, will always be present in greater or less amount.

In the sulphate works, the saturator gases contain from 10 to 45 per cent. of sulphuretted hydrogen with carbon dioxide, and in a less degree hydrocyanic acid as diluents; the strength and rate of feed of liquor distilled often varying within wide limits even in the same works. In sulphate works where concurrent revivification is practised, the air is generally admitted without measurement, and no scientific control of temperature is attempted by means of thermometers embedded in the mass. Moreover, unlike the coal-gas purifiers, which are closed boxes, the sulphate purifier is almost invariably in the form of an open tank or heap, freely exposed to the action of the air and not unseldom to the weather. It is a remarkable testimony to the efficiency of oxide of iron as a purifying agent that such excellent results should be obtained in practice, seeing that the method of working, scientifically speaking, is so crude. Be this as it may, however, the working of the sulphate purifier is sufficiently similar to that of the coal-gas purifier to justify the belief that the efficient working of both is governed by much the same set of conditions, and that a study of the reactions that have been shown to occur in coal-gas purification may afford the key to the anomalous behaviour of the oxide in works where "souring" of oxide is a chronic source of trouble.

From the date of the earliest application of oxide of iron for removal of sulphuretted hydrogen from crude coal gas, it has been recognized that the process occurs in two stages: (1) The sulphiding stage, during which the oxide (or hydrated oxide) reacts with sulphuretted hydrogen to form a sulphide (or sulphides) of iron. (2) The oxidation stage, during which sulphide of iron is re-oxidized with formation of oxide (or hydrate) of iron and free sulphur.

(1) *The Sulphiding Stage.*—Various equations have been put forward from time to time to account for the results obtained in practice. The equations are based upon an analysis of the products obtained when sulphuretted hydrogen, carefully freed from adventitious oxygen, is allowed to react upon pure hydrated oxide of iron in a U-tube suitably cooled to moderate the heat of reaction, and connected with a calcium chloride tube or other vessel to retain the water set free. The reactions are usually represented as taking place according to one or both of the following equations:—

(A) $Fe_2O_3 + 3H_2S = Fe_2S_3 + 3H_2O$,
or, $Fe_2O_3.H_2O + 3H_2S = Fe_2S_3 + 4H_2O$.

(B) $Fe_2O_3 + 3H_2S = 2FeS + S + 3H_2O$,
or, $Fe_2O_3.H_2O + 3H_2S = 2FeS + S + 4H_2O$.

Lewis T. Wright, a pioneer worker in this field, considered that both reactions occurred simultaneously; 17 to 30 per cent. of the sulphuretted hydrogen being absorbed according to Equation B. He pointed out that there is no fixed relation A to B, but was able to suggest no cause for the variation. Wright's equations

have generally been accepted in this country as best expressing the reactions that occur in gas-works purifiers, though his experiments were conducted with sulphuretted hydrogen, more or less free from diluent gases.

In 1905, a valuable contribution to the literature of the subject was made by L. Gedel, who published in the "Journal für Gasbeleuchtung" (May 13, 1905) the results of a protracted research on sulphide of iron in purification carried out at the Carlsruhe Chemical Technical Institute. Gedel found that the nature of the reaction that took place between sulphuretted hydrogen and hydrated oxide of iron was profoundly modified by the presence of traces of acid or ammonia in the gas. Sulphuretted hydrogen, if it contains a little hydrochloric acid, acts upon hydrated peroxide of iron so as to form FeS and FeS_2 (product X); the formation of disulphide being due to a secondary reaction brought about by the heat developed by the primary reaction. On the other hand, if the sulphuretted hydrogen contains a little ammonia in place of hydrochloric acid, we then obtain Fe_2S_3 (product Y) without any FeS_2.

The purifying material from gas-works was found by Gedel to contain sesquisulphide, but no protosulphide or disulphide of iron. The reaction in the purifying-box is therefore considered by him to take place according to Equation A:

$$Fe_2O_3 + 3H_2S = Fe_2S_3 + 3H_2O,$$

or, as Gedel expresses it, $Fe_2(OH)_6 + 3H_2S = 6H_2O + Fe_2S_3$.

He attributes the absence of protosulphide and disulphide to the presence in the gas of a small quantity of ammonia, so that the product is Product Y above and not Product X. It is also desirable, he says, that the temperature should be kept down.

(2) *The Oxidation Stage.*—The oxidation stage is usually represented by the following equations:—

$$Fe_2S_3 + 3O = Fe_2O_3 + 3S,$$

or, $Fe_2S_3 + 3O + H_2O = Fe_2O_3.H_2O + 3S$.

$$2FeS + 3O = Fe_2O_3 + 2S,$$

or, $2FeS + 3O + H_2O = Fe_2O_3.H_2O + 2S$.

Discussing the behaviour of the two products X ($FeS + S + FeS_2$) and Y (Fe_2S_3), Gedel finds that if the product X be exposed to air the FeS_2 which it contains remains unaffected by oxidation; while product Y goes completely over into the form of iron peroxide with separation of sulphur. In both cases, however, small quantities of sulphate of iron are formed, the amount of which increases as the temperature rises.

If air and sulphuretted hydrogen are allowed to act simultaneously on oxide of iron, the sulphiding and oxidation stages occur simultaneously within the mass. Theoretically, with an amount of oxygen present equivalent to the sulphuretted hydrogen (2½ volumes air for 1 volume H_2S), the purification should continue without limit; but in practice it is found that the oxide has to be thrown out before it has done the full amount of work. This is due either to abnormal back-pressure or to a foul test. Kunath attributes the imperfect action of the oxygen to the fact that the sulphiding stage proceeds more rapidly than the oxidation stage under the conditions existing in oxide purifiers, so that the oxidizing reaction tends to lag behind if the gas be sent through too rapidly, and the purifying material soon becomes inefficient. Kunath considers 5 volumes of air to 1 volume of gas by no means too high; but this conclusion can hardly be said to take much account of the value of the purified gas as an illuminant. ["Gas World," Feb. 8, 1908, p. 158.]

Such are the reactions that are considered to take place where oxide of iron is submitted to sulphiding and revivifying processes. Theoretically, it should be possible to convert the whole of a given mass of ferric hydrate into sulphide by the prolonged action of excess of sulphuretted hydrogen at ordinary temperature; but it appears to be generally recognized that the process is difficult to complete. In Lewis T. Wright's experiments referred to above, the amount of ferric hydrate entering into the reaction varied from 77·5 to 92·5 per cent. The reason for this behaviour is obscure. Wright concluded that there are two forms of oxide—one active, the other inactive; and he devised various methods of separating and estimating the amount of each in a given sample.

Lewis Thompson, in his "Chemistry of Gas Lighting," says: "It is quite certain that the activity really depends neither upon hydration nor dehydration, but is connected with a peculiar molecular arrangement rather mechanical than chemical in its nature." John T. Sheard ["Journal of Gas Lighting," April 4, 1893, p. 633], finds that brown hæmatite (ferric hydrate) dried at 100° C. (= $Fe_2O_3.H_2O$) behaves as follows:—

(*a*) Dried at 100° C., absorbed 12·8 per cent. of sulphur.
(*b*) Strongly ignited to drive off water, 11·6 per cent. of sulphur.

On the other hand, R. E. Hughes states ["Philosophical Magazine," May, 1892, p. 471], that the results so far obtained by him point to the conclusion that with perfectly dried oxide of iron and sulphuretted hydrogen no change would take place. Thus, 5·8108 grammes of Fe_2O_3 absorbed only 0·0832 gramme of H_2S, or 1·4 per cent. And it is a well-known fact that burnt pyrites, even when mixed with sawdust and well wetted, is exceedingly sluggish when first exposed to the action of sulphuretted hydrogen gas. [Tysoe, in the "Journal of Gas Lighting" for Nov. 19, 1907, p. 566.]

Dr. Stavorinus [discussion in "Het Gas," abstract translation in the "Gas World," Feb. 8, 1908, p. 158] is of opinion that both natural and artificial purifying materials owe their efficiency to oxide in a more or less hydrated form. He recognizes two forms of ferric oxide—yellow and red. The red is formed when solutions of ferric salts are precipitated by alkalies; the yellow when precipitates of ferrous hydrate or carbonate are oxidized by exposure to air. The yellow form is more condensed and has less chemical energy than the red. The red is colloidal; on drying it tends to become insoluble in dilute acid. The yellow is colloidal, but is nearer to the crystalline condition than the red. On heating, the red form changes to the crystalline with liberation of energy; with the yellow form, there is no such liberation of energy. Stavorinus holds that in purification the mass is most useful that has in it the greatest proportion of red colloidal oxide.

Heer J. Rutten, of the Hague (*ibid.*), on the other hand, combats the views of Stavorinus as to iron oxide; he prefers a light, porous natural oxide. Finally, the Editor of the "Gas World," in an editorial note published on May 30, 1908, p. 684, pertinently remarks: "Whatever the condition of the oxide before exposure in the purifier, in revivification it is formed anew, by the action of the oxygen of the atmosphere on ferrous or ferric sulphide; and we do not know that it has been demonstrated that the new ferric oxide thus created is necessarily hydrated." With respect to the view expressed by the writer in the "Gas World," it is certainly the fact that revivification of sulphide is dependent upon moisture. Dry sulphide is not acted on by oxygen until moistened with water; the presumption is, therefore, that the oxide formed is a hydrate, and that the sulphide is not hydrated, though analytical proof is lacking.

Conditions for Maximum Efficiency of Oxide in Gas-Works Purifiers.

It would be out of place here to attempt to discuss in detail the conditions that control the efficient working of an oxide purifier; the manager of every large works will have his own ideas as to the best oxide to use and the best way of using it; but the effect of certain factors calls for notice as throwing light upon the working of sulphate of ammonia purifiers. It is generally recognized that oxide purification is affected to a marked extent by the amount of moisture present in the oxide and reacting gases, by the ammonia and cyanogen contents of the crude coal gas, and by the working temperature of the mass.

(1) *Hydration.*—The advantage of maintaining the purifying material in a condition of suitable humidity has long been recognized in practice; an insufficient amount of moisture is found to be prejudicial to efficient purification equally with an excess of moisture. The amount of moisture is determined to a large extent by the physical characteristics of the material used; and the limits of humidity advised by various authorities necessarily varies. J. T. Sheard lays down the rule ["Journal of Gas Lighting," April 11, 1893, p. 633] that the oxide should be moistened, so much as, and no more than, will agglomerate its friable powder into a light granular condition and enable it to hold together on the grids. Lewis T. Wright [Thorpe's Dictionary of Applied Chemistry, Vol. II., Article on "Coal Gas"] considered that the oxide should contain 10 to 20 per cent. of moisture. W. R. Chester [twenty-ninth annual meeting of the Gas Institute, June, 1892] stated that efficiency is at a maximum when 4 per cent. of moisture is present; for large purifiers, he would advise 4 per cent.; for small, 10 per cent.

F. G. Dexter, of Winchester, a pioneer worker in this field, in a paper read before the twenty-ninth annual meeting of the Gas Institute in 1892, drew attention to the use of "Steam as an Aid to Revivification of Oxide of Iron *in Situ*." Dexter found that concurrent revivification by air injection without the use of steam tended to become self-destructive by the removal of the necessary moisture. He claimed that the life of the oxide is greatly prolonged if a due proportion of steam is admitted with the air. The function of the steam is considered by him to be twofold, both mechanical and chemical—humidity diminishes the tendency of the oxide to cake together and harden, the heat evolved by chemical reaction, if excessive, is reduced; while the heat of reaction, if deficient, is increased by the introduction of a large body of water vapour at 90° to 100° Fahr. (32° to 38° C.), a temperature very favourable to revivification of oxide.

(2) *Ammonia and Cyanogen in Crude Coal Gas.*—Opinions differ as to the advantage of admitting ammonia to the purifiers. Lewis T. Wright [Article on "Coal Gas" in Thorpe's Dictionary of Applied Chemistry] states that oxide should be only used to purify gas already free from ammonia and cyanogen; if ammonia is present in conjunction with cyanogen, there is an inconvenient formation of ferric ferrocyanide, rendering the oxide inactive.

L. Gedel considers that the presence of ammonia in the purifiers is highly necessary. In its absence, in place of the desired product Fe_2S_3, we get FeS, sulphur, and, secondarily, the detrimental FeS_2. Harold E. Stone [paper read before the Midland Junior Gas Engineering Association, December, 1911], on the other hand, while admitting that there is a tendency for the oxide to become acid during use, questions if the use of ammonia is a good cure for this. Ammonia in conjunction with cyanogen, he points out, is very destructive of iron work in boxes, meter drums, and gasholder plates.

The admission of a little ammonia with the gas is considered to be helpful by the writer of an editorial note published in the "Gas World" on March 6, 1909, p. 324. It is suggested that sulphite or sulphate of iron formed during the revivification stage is brought thereby into a useful condition for absorption of H_2S.

(3) *Temperature.*—Exact information as to the temperature reached during the sulphiding and revivifying processes and its effect upon the reaction in working practice appears to be lacking.

A number of laboratory experiments were undertaken by J. T. Sheard ["Oxide of Iron: a Monograph"—"JOURNAL OF GAS LIGHTING," April 18, 1893, p. 679] to determine the amount of sulphuretted hydrogen absorbed by oxide of iron at different temperatures; but the temperatures recorded are those of the atmosphere or water surrounding the reaction tube, not that of the oxide itself. The results, therefore, are of no precise value for the purpose in hand. Sheard [*ibid.*, p. 773] concludes from his experiments that it is dangerous to allow the temperature to rise as high as 200° Fahr. (93° C.); but below this point, he says, the higher the temperature the more absorbent will be the oxide. Rise of temperature is of especial advantage if the material be sluggish. It is to rise of temperature in great part that he attributes the improved working of the purifier in Dexter's experiments during the winter months. Sheard states that the material should attain to such a temperature as will facilitate the ready expulsion of water that has been formed by chemical action. The material during revivification, he says, should be exposed to a comparatively dry atmosphere. If the oxide be sluggish, artificial means may, with advantage, be resorted to for raising the initial temperature of the mass so long as the temperature is kept well under control [*ibid.*, p. 679].

Further, Dr. W. Leybold, of Hamburg ["JOURNAL OF GAS LIGHTING," Sept. 8, 1896, p. 460], states that the temperature during revivifying may reach 140° to 160° Fahr. (60° to 70° C.) even in presence of an ample supply of moisture. Revivification, he finds, is complete on the surface by the second day, no H_2S being evolved on acidifying with HCl; lower down in the mass, oxidation proceeds more slowly.

In a record of the proceedings of the Bureau of Information of the American Gas Institute for 1908, it is stated, in reply to a question as to the effect of temperature on revivifying of purifying material, that if the foul oxide be spread very thin and exposed to a low temperature, reaction will start, but will be greatly retarded, and continue feeble and slow, and in proportion as the temperature is allowed to increase the intensity of the reaction will increase; the safe limit of temperature to be allowed being found at a safe distance below the fusing-point of sulphur, which is 239° Fahr. (115° C.). The upper limit is placed at from 100° to 180° Fahr. (38° to 82° C.); the general trend of opinion seeming to point to 120° Fahr. (49° C.) as the temperature at which revivification will progress most satisfactorily.

Thermochemical Data.—During the past few years various attempts have been made to calculate the thermal effects produced during the sulphiding and oxidation stages. We are on uncertain ground when we attempt to apply thermal data obtained under one set of conditions in the laboratory to calculate the calorific effect produced in a works purifier where the physical conditions of the reacting solids and reaction products in respect to density, specific heat, and state of aggregation are necessarily so very different; but the results are not without value. They clearly demonstrate the fact that the oxidation stage is the one in which the calorific effect is greatest, and that the amount of moisture in the mass governs the temperature, the specific heat of water and the latent heat of its vapour being so high that other factors than the amount of moisture affect the result to a very slight extent.

As an example of the method of calculation in its simplest form, we may take the statement by Bunte. [Address delivered before the German Gas and Water Association, Düsseldorf, 1902.] This author has based his calculation upon an equation that expresses only a part of what happens in gas-works purifiers; but the combined net calorific effect for the sulphiding and oxidation stages in Bunte's calculation is accurate and complete, as the *ultimate* heat effect is that involved by the oxidation of $3H_2S$, and is independent of the sulphide formed, provided that the original weight of hydrated oxide is reformed, the two equations given by Bunte in their combined effect being equal to the single equation—

$$3H_2S + 3O = 3H_2O + 3S \quad + 159{\cdot}9 \text{ calories.}$$

Bunte proceeds as follows:—

First Stage—

$$Fe_2O_3.3H_2O + 3H_2S = 2\,FeS + S + 3H_2O \text{ (vapour)} + 3H_2O \text{ (liquid)}.$$

Calories—$(193 + 3 \times 4{\cdot}8) + (2 \times 24 + 3 \times 58{\cdot}1) = +14{\cdot}9$ net.

Second Stage—

$$2FeS + S + 3O + 3H_2O = Fe_2O_3.3H_2O + 3S$$

Calories—$(2 \times 24) + (193) = 145{\cdot}0$ „

Total heat evolution = 159·9

Net result for simultaneous fouling and revivification per 1 cubic metre of H_2S:—

$$(1) = \frac{14{\cdot}9}{102{\cdot}2} \times 1520 = 222$$

$$(2) = \frac{145}{102{\cdot}2} \times 1520 = 2160$$

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If we take the specific heat of 1 cubic metre of coal gas to be ·362, and further assume that all the heat is taken up by the gas, the rise in temperature for 1 per cent. H_2S would be—

$$(1) \frac{222}{362} \times \frac{1}{100} = 6{\cdot}1° \text{ C.}$$

$$(2) \frac{2160}{{\cdot}362} \times \frac{1}{100} = 65° \text{ C,}$$

Experiment shows, says Bunte, that fresh oxide of iron rises 30° C. in the purifiers.

A more elaborate calculation of the heat generated by the reviving of fouled oxide of iron has been made by Herman Poole in a paper published in the "American Gaslight Journal" [Jan. 31, 1908, p. 2]. Equations are given for various hypothetical cases as follows:—

First Case.—Revivification of pure sesquisulphide (Fe_2S_3) by air—

$$Fe_2S_3 + 3O \text{ (air)} + H_2O = Fe_2O_3.H_2O + 3S.$$

Calculated rise of temperature = 804° C. (1479° Fahr.).

Second Case.—Revivification as above, accompanied by evaporation of moisture, say 25 per cent. of the entire mass.

Calculated rise of temperature = 539° C. (1002° Fahr.).

Third Case.—Revivification in a mass containing wood chips in addition to moisture. Thus—

	Per Cent.
Iron oxide	35
Wood	15
Sulphur	25
Water	25

Calculated rise of temperature, assuming no evaporation—

(*a*) 300° C. (572° Fahr.).

Calculated rise of temperature, assuming one-half of the water vaporized—

(*b*) 54° C. (129° Fahr.).

A similar calculation for FeS gives—

First Case.—Calculated rise	1310° C. (2390° Fahr.).
Second Case.—Calculated rise	900° C. (1652° Fahr.).
Third Case.—Calculated rise—	
(*a*) No evaporation	420° C. (788° Fahr.).
(*b*) One-half of the water vaporized	200° C. (412° Fahr.).

The conclusion reached by Poole is that as the two sulphides are mixed in the product the extreme temperature will not much exceed 350° C.

A valuable contribution to the subject will be found in an article on "The Heat of Revivification of Oxide," published in the "JOURNAL OF GAS LIGHTING," Feb. 15, 1898, p. 337. The author follows Mr. Poole's initiative, but simplifies the investigation by assuming that the oxide has been fouled under ordinary conditions, and that the reactions have proceeded according to the equations of Lewis T. Wright.

The conclusion reached by the writer is that, assuming that the initial temperature of the mass before revivification was at 15·5° C., and that no water is evaporated, the final temperature attained would be 357° C., or 675° Fahr. (*Ibid.*, p. 995.)

If the whole of the free water were evaporated, the final temperature attained would be 136° C. (277° Fahr.).

In a further article (*ibid.*, p. 582), the same contributor submits a statement showing the calculated rise of temperature during sulphiding process in a coal-gas purifier. Assuming no vaporization, the rise of temperature would amount to 53° C., and the final temperature would be 68·5° C. (155° Fahr.). Some water would be vaporized before this temperature is reached; and it is fair to assume, therefore, that no dangerous temperature can arise by the reactions involved in fouling *per se*.

We now proceed to describe the results of the experiments made on oxide purification as conducted in sulphate of ammonia works.

LABORATORY AND WORK TESTS.

During the past year, a considerable body of data has been collected with respect to the conditions controlling the oxide of iron purification process, and progress made towards the elucidation of the cause of "souring" referred to in the introductory remarks. But the work has proved to be much more arduous than was anticipated, and much yet remains to be done before a final judgment can be given. Sufficient advance has been made, however, to justify one in drawing certain conclusions; and it is hoped that opportunity may be found to continue the research.

The results of the present inquiry, for convenience, are considered under the following heads: (1) Laboratory Experiments and Theoretical Discussion. (2) Works Tests. Temperature Records of the Working of Oxide Purifiers, with Revivification *in situ*. (3) Data supplied by Works Managers with respect to Sulphate of Ammonia Practice throughout the Country.

1.—LABORATORY INVESTIGATION.

The procedure followed consisted in passing a measured volume of a mixture of sulphuretted hydrogen and carbon dioxide, with or without addition of air, through oxide of iron contained in a U-tube immersed in a glycerine bath. The temperature was recorded by means of two thermometers placed one in the oxide and one in the bath—conditions being such as to maintain the oxide within the tube at the desired temperature. The exit gases leaving the U-tube were passed successively through bottles containing N/10 iodine solution to absorb residual H_2S and SO_2, and N/10 thiosulphate to retain traces of iodine vaporized by the current of gas. The gaseous mixture was contained in a large graduated vessel holding 17 litres; the gas being in direct contact with a layer of cylinder oil floating on water to minimize absorption of the sulphuretted hydrogen and carbon dioxide. The vessel was provided with suitable connections and with a levelling bottle capable of adjustment at any desired height, and fed with a stream of water to enable the pressure in the aspirator to be maintained

at the desired pressure. The necessary movement of gases through the system was secured by a Marriott's bottle placed at the exit end. The reacting mixture entered the U-tube throughout the experiments in a condition saturated with moisture at atmospheric temperature. In one experiment, additional moisture was provided by passing the mixture through a U-tube containing cotton wick standing in water and maintained at constant temperature by a water bath, the amount of water vaporized by the gases being obtained by weighing the water-tube before and after the experiment. Following the practice observed by earlier workers, the current of gas was passed downwards through the oxide. By this means the sulphiding process proceeds more uniformly to completion. The diameter of the tube was approximately 1·4 cm., with an effective cross section (allowing for the bulb and stem of the thermometer) of 1·54 sq. cm. The oxide was placed in the inlet limb of the U-tube, and was supported by a grid of platinum gauze resting on a glass stopper placed well above the bottom of the U-tube to prevent contact with any water condensed during the experiment. The length of the column varied from about 2 to 3 inches according to the physical condition of the oxide used. A distinct increase of volume was noticeable after sulphiding and reoxidation; the degree of hydration also influenced the volume to a marked degree. The actual time of contact of the reacting mixture with the oxide varied, therefore, from one experiment to another, and no exact figures can be given. An approximate estimate, however, has been made by calculation, and the figure is presented below, where the question of the rate of flow of gases through oxide purifiers generally is under discussion.

The figures given in the appended tables are approximate only. Cylinder oil is not entirely impervious to sulphuretted hydrogen, and the H_2S percentage figure was found to fall slightly during the course of each experiment. This was allowed for in the calculations. Temperature regulations of the oxide also proved to be troublesome, governed as it was by so many factors—hydration, rate of flow, and composition of gas. But, in general, the temperature variations, as shown by the thermometer with its bulb imbedded in the oxide, did not exceed 5° C. above or below the average figures given in the tables. Rate of flow of gases through the tube was regulated by the appearance of the oxide and the temperature. With efficient absorption, a maximum rate of about 60 c.c. mixed gases per minute was reached at the beginning of an experiment; at the end, the rate had to be reduced to about 15 c.c. per minute, or even less, to minimize escape of sulphuretted hydrogen. The current of gas was finally stopped when 50 c.c. of N/10 iodine was decolorized in the catch. The end-point had to be arbitrarily chosen, as conversion of oxide of iron into sulphide is never complete, even after prolonged treatment. Calculation shows that, allowing for the phosphate of iron present in the natural oxide used in the experiments, the maximum absorption of 1·850 grammes sulphur, as sulphuretted hydrogen, absorbed corresponds to a conversion of 92·1 per cent. of the oxide of iron present into sulphide, which may be compared with Lewis T. Wright's figure, 92·5 per cent. for pure hydrated oxide. In every experiment, the air present in the tube was displaced by carbon dioxide before starting the flow of gas, and at the end residual gases were displaced in the same way.

The gaseous mixture throughout was prepared by running a concentrated solution of pure sodium sulphide into excess of dilute sulphuric acid, the evolved gas being passed direct into the measuring vessel. Carbon dioxide, generated from a Kipps apparatus, was then sent in until the mixture by measurement approximated to the desired strength. After standing an hour or so to mix, a sample of the gas was withdrawn by a Bunte burette, and the proportions of H_2S, CO_2, and residual air determined by absorption with caustic soda and titration with N/10 I. and thiosulphate in the manner described in the annual report for 1903. A single example will suffice to illustrate the results (per 100 volumes) obtained by this procedure:—

	At start (12 noon).		At finish (3 p.m.).		Mean during Expt.
CO_2	67·3	..	67·5	..	67·4
H_2S	31·7	..	31·4	..	31·5
Residual	1·0	..	1·1	..	1·1

At the end of an experiment, the U-tube was cooled, and the sulphide thrown out on to a plate to oxidize, and well wetted with water. After wetting, a small amount of the supernatant liquid was at once withdrawn by a capillary tube, and tested for acidity and soluble salts of iron in the usual way. The results are recorded in the appended tables as denoting "Properties of Sulphide as Withdrawn from the Tube." The product was then exposed to the action of air in an oven at about 40° C., to evaporate the water and complete the oxidation; the mass being stirred from time to time to break up lumps and promote aëration, and the drying continued at 40° C. until the oxide contained about 25 to 30 per cent. moisture. It was then tested for acidity and soluble salts of iron by wetting a small portion of the mass and withdrawing a drop of the liquid for examination as before; the wetted portion being re-dried and returned to the mass. The results of such tests are recorded in the tables as denoting "Properties of Oxide Dried at 40° C." The moist oxide was then further dried by exposure to air at 25° C. or 100° C., as the case might be.

The revivified oxide was returned to the tube and again sulphided, and the product treated exactly as before. At the conclusion of a series, the oxide was dried at 100° C., and the free sulphur extracted by carbon-bisulphide. The difference figure obtained by subtracting the weight of free sulphur determined in this way from the weight of total sulphur entering the tube as sulphuretted hydrogen gives the figure denoting "Sulphur in Other Forms by Diff." No quantitative analyses have yet been made on the oxide left after the extraction of the free sulphur—time has not allowed of this being done—but qualitative analysis indicates that sulphur is present in the combined form as basic sulphates of iron, disulphide, and traces of free acid.

The oxide used in the experiments was a natural oxide containing a small proportion of magnetic oxide. As received, it contained 23·5 per cent. of moisture; dried at 100° C., analysis showed:—

	Per 100 Parts.
Organic matter and combined water—loss at red heat	30·85
Silica and gangue (insoluble in strong HCl)	8·90
Ferric oxide, Fe_2O_3 (excluding phosphate)	48 70
Ferric phosphate { Fe_2O_3 3·7 / P_2O_5 3·3 }	7·00
Alumina, &c.	1·20
Sulphuric acid as SO_3	1·50
Lime as CaO	1·65
Manganese, traces	—
	99·80

48·70 parts of Fe_2O_3 should theoretically absorb $\frac{96}{160} \times 48{\cdot}70 =$ 29·2 parts of sulphur as H_2S.

In each experiment 9 grammes of undried oxide were employed = 6·875 dried = 29·2 × (6·875 ÷ 100) = 2·009 H_2S as sulphur = 2·009; 2·009, therefore, is the maximum amount of H_2S that could be absorbed for complete conversion of Fe_2O_3 into Fe_2S_3, if ferric phosphate be excluded from consideration; if oxide as phosphate be included, the amount would be 2·161 grammes of H_2S as sulphur. The actual maximum figure reached in the experiments was 1·850 grammes = 92·1 per cent. of 2·009.

The behaviour of the oxide on exposure to air shows that the amount of moisture absorbed or given up depends on the degree of humidity and the temperature of the air.

	Per Cent.
Moist hydrate exposed to air in oven—	
At 100° C. for five hours lost	23·55
For further five hours lost	0·05
At 60° C. for fifteen hours lost	20·60
For further five hours lost	0·02
Moist hydrate exposed to air on plate—	
At 30° C., five days, lost	13·4
Further exposed, one day, weather cooler and damper, gained	0·3
Further exposed, one day, weather warmer and drier, lost	0·2
At 30° C. in desiccator over acid, ten days lost	18·0
Further exposed, one day lost	*Nil*
The desiccator sample (loss 18) on exposure to air at 30° C., ten days gained	4·3
Further exposed thirteen days, gained	0·6
Total	4·9

The results of the various experiments made in the manner described are recorded, with observations thereon, in tables appended to this portion of the report. These, with some further extracts, including data supplied by works managers with respect to sulphate of ammonia practice, will be noticed in a subsequent issue.

Upkeep of Shop-Lighting Systems.—In a recent number of the "American Machinist," Mr. C. E. Clewell had a paper on shop lighting, in which he indicated the economy of keeping lights clean and efficient. Attention was drawn to some of the items involved in the maintenance of shop-lighting systems at high continuous efficiency; and from the standpoint of economy alone, the expense was justified. When to economy are added the comfort and assistance that a well-regulated system gives to employees, the matter becomes yet more important. The outlay for lighting upkeep is more than compensated by better illumination, more contented employees, and a more cheerful shop.

A "Semi-Gas Furnace."—What is described as "A Revolution in Heating" was the subject of a special article in the "Pall Mall Gazette" last Saturday; and if the invention concerned achieves all that is promised, it is stated that the prospects of coal owners and miners will be seriously threatened. The appliance which is to bring about this condition of things is called a "semi-gas furnace," and it has been patented by Mrs. Cayley-Robinson, who obtained the idea from a German working engineer. The lady claims that she has succeeded in generating heat by means of circulating gases instead of the ordinary blazing furnace, and with a minimum of air, and therefore slow combustion, instead of a strong draught and rapid combustion. The process is stated not only to effect a large saving in fuel, but to give a pure white flame invaluable for smelting purposes; and it does away with smoke, soot, clinkers, and ashes. Mrs. Cayley-Robinson has satisfied herself that with an enormous heating power her furnace saves about two-thirds of the fuel. She says that with only 3 lbs. of coal she has melted copper in an ordinary kitchen grate, and has kept up baking heat in a moderate-sized kitchen range, with two ovens, burning no more than 1 lb. of coal per hour. The main feature of the furnace appears to be that the gases generated circulate through it so long as they contain any combustible material. The invention may be more fully noticed when the English specification is available.

A HYDRAULIC MAIN EXPERIENCE.

By J. F. Tyndall, of Wicklow.

[A Paper read before the Irish Association of Gas Managers.]

Seeing that the hydraulic main plays so important a part in the manufacture of gas, the writer is moved to place an experience before you, after reading an extract from a discussion following an interesting paper by Mr. T. Brooke, read before the Yorkshire Junior Gas Association, on "Phases of Retort-House Practice," as below (*vide* "Journal of Gas Lighting" of April 23 last):

> Mr. Brooke admitted all that had been said about oscillation. . . . . In his experience, the longer the main the more serious was the disturbance; while cutting the main into sections checked the development of waves travelling along the main. He had seen 3 or 4 inches of oscillation in a long main. Mr. Edwards had seen as much as 6 inches in a section where there were only six ascension pipes.

This appeared to confirm a theory formed by the writer as to the cause of an experience he had some time ago during the erection, and subsequent working of a hydraulic main; and he ventures to think it may be of interest to his colleagues, especially in small works that are striving to imitate the carbonizing results of the larger undertakings, in which strivings the manipulation of the hydraulic main may form an important item.

From early days we have been taught that the hydraulic main is primarily intended to fulfil two important functions—viz.:

(*a*) To prevent air being drawn in when lids are open for drawing and charging retorts.

(*b*) To prevent back-pressure forcing gas back down the ascension pipe, should the exhauster be stopped through any cause.

In small works, such as those which form the majority of this Association, the latter function is perhaps the more important to guard against; and when one reads from time to time in the Technical Press of such seals as 4-10ths, half-inch, and even dry mains, one may be pardoned for being openly sceptical as to the ability of such seals—or the absence of seals—fulfilling either function, and to sound a note of warning against imitating too closely the methods of larger undertakings, which, be it remembered, have the undivided attention of foremen, and the reliability and reserve of apparatus and plant not possible on the smaller works. An extra 200 cubic feet of gas per ton may be bought too dearly; and, after all, the nitrogen and carbonic acid content always gives an explanation. But is the risk worth it?

Of course, the seal of a dip-pipe is governed entirely by the relative area of the hydraulic main and dip-pipe, and by the normal back-pressure it may have to withstand in case of a breakdown or sudden stoppage of the exhauster, and may be calculated from the following formula:

> The seal of an hydraulic main may be broken backwards or forwards according to the pressure or vacuum, and depends entirely upon the relative areas of the dip-pipes and the surrounding liquid-omitting density.

To break a 1 inch seal backwards requires

$$\frac{a+b}{a}$$

and forwards, with the same seal, $\frac{a+b}{b}$

where a = the sectional area of the dip-pipes (internal) in square inches.

b = the area of the surrounding liquid in square inches.

Some time ago, the writer was engaged on the reconstruction of a gas-works. Among other plant was an entirely new retort-bench, consisting of four beds of retorts, each pair being heated from one producer built on the ground level and sandwiched between the settings, so as to obtain the advantages of gaseous firing with regeneration, where it was otherwise impossible to go down owing to high water level at spring tides. The existing hydraulic main, mouthpieces, and ascension and bridge pipes, were utilized on the new bench; but all buckstays, tie-rods, &c., were new, and so arranged as to carry the hydraulic main over the front of the settings, instead of on top as usual.

The general arrangement is shown in fig. 1, which is a part

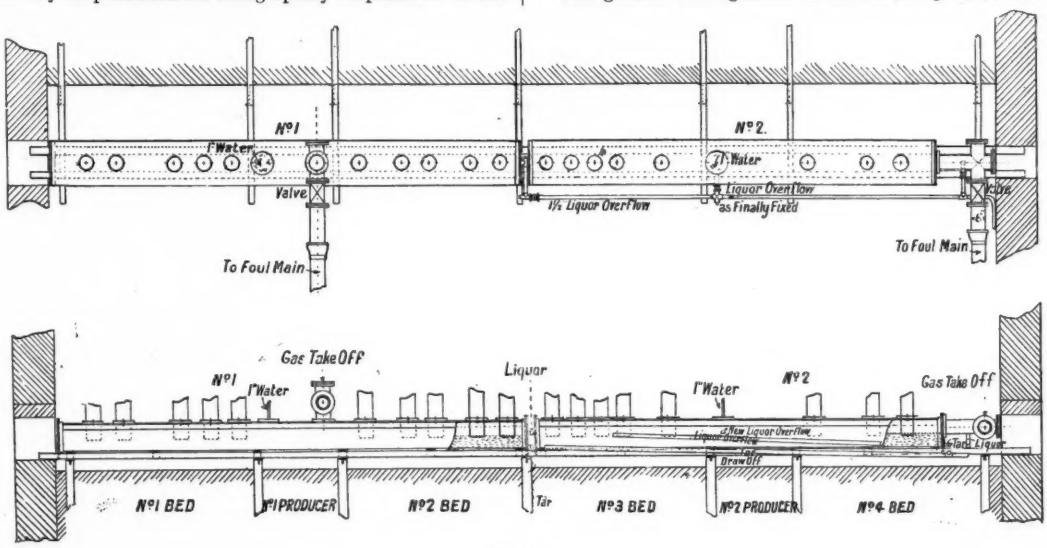


Fig. 1.

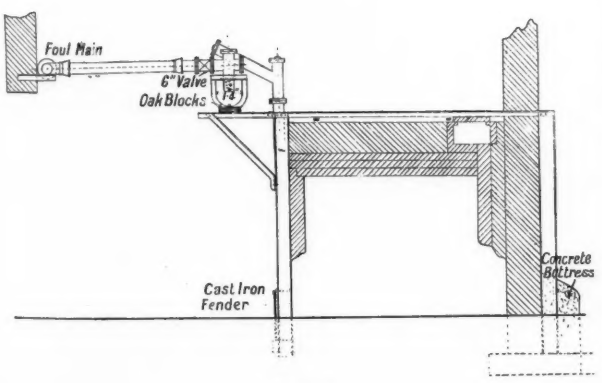


Fig. 2.

sectional plan and elevation of the hydraulic main; while fig. 2 shows a full cross section of the method adopted.

Particular attention is drawn to the means provided for taking off the gas, tar, and liquor. It will be noticed that the settings were feeding into two mains Nos. 1 and 2. Both had a 1-inch town water supply connected for flushing and refilling. No. 1 main provides for the gas being taken off from the top of the main about mid-way. A liquor overflow is provided by a 1½-inch pipe from one end; while tar is drawn off at regular periods by the same size pipe from the bottom of the same end plate. No. 2 main provides for the gas and liquor being taken off through a 6-inch opening at one end; the tar being drawn from the bottom, as in No. 1.

The plans provided for a 1-inch seal, which was calculated to withstand a back-pressure of 14·4 inches. As, however, the combined pressures in case of a stoppage of the exhauster, either accidental or for oiling or examining the gas-engine, was 9·5 inches (which could be immediately reduced to 6·5 inches by bye-passing the washer), the writer decided to cut down the seal to ¾ inch, which would withstand 10·8 inches, and incidentally might add another 200 cubic feet of gas per ton of coal carbonized. Consequently, the liquor overflow in both mains was set to give a ¾-inch seal, as shown by the heavy line in fig. 3, which is an enlarged part sectional elevation of the two mains. No. 1 main worked throughout the ensuing winter without a hitch and with very satisfactory carbonizing results, which averaged 11,500 cubic feet per ton of coal carbonized and 7000 cubic feet per mouthpiece per day.

In the April following, it was decided to light up No. 4 bed for the summer work. The retorts in No. 3 bed (of fives), which communicated with the same hydraulic main, were plugged in the ascension pipe at the mouthpiece, built up at the junction of the retort and mouthpiece, and the lids put loosely on. The lighting-

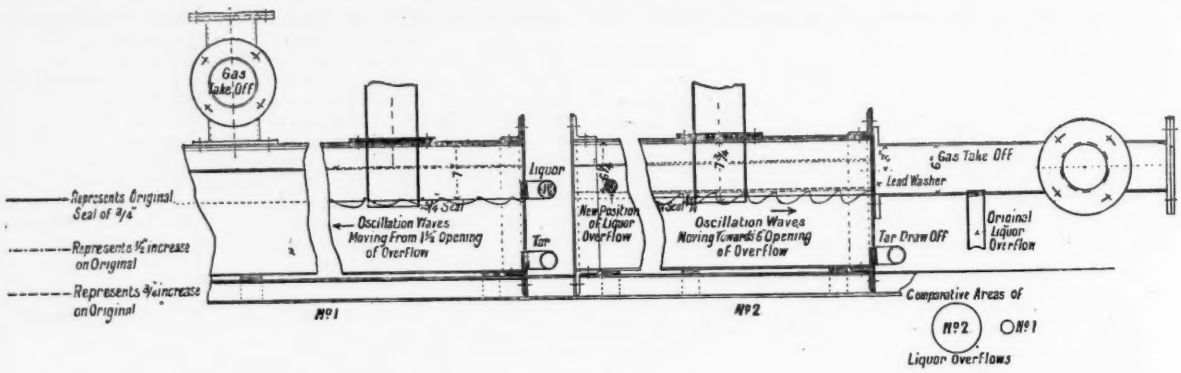


Fig. 3.

up was successfully carried out, the hydraulic main filled, and the foul-main valve opened, with the exhauster standing to test the effect of back pressure, and all seemed apparently right.

As occasion arose for stopping the gas-engine for oiling, &c., it was noticed that the back-pressure was breaking the seal backwards. This was set down to the evaporation of water from the main; and until a denser mixture of liquor and tar should form, the water supply was allowed to run very slowly through the main, which effectively held the back-pressure.

As no improvement, however, was effected within a few days, it was decided to assist matters by adding some light tar to the hydraulic main. Even this failed, however, and doubts arose as to the level of the main, or the correct depth of liquor overflow. All dips were previously known to have level ends and to be of equal length. The main was tested by spirit-level, and appeared practically level. The liquor overflow was checked by No. 1 main, which had worked without a hitch throughout the winter, and was found correct. The tar draw-off tap was examined for possible leakage, but was found perfectly tight. The cause of the unsealing of the dips in No. 2 main, therefore, became an anxious problem.

The seals were then raised ½ inch by inserting a lead washer between the end of the main and the flange of the 6-inch cross, as the possible effects of wave oscillation through the 6-inch opening was beginning to dawn on the writer. Even this did not effectually prevent the back-pressure breaking the seal whenever the water supply was stopped; and it was soon demonstrated that a town's water supply was not always dependable, and the consequences serious.

Of course, a reserve tank overhead, with liquor pump, would have served the purpose, but would not have removed the cause; and the writer was more interested in solving the trouble than in spending money on temporary expedients. So after considerable study of the probable effects of what was going on in the two mains—No. 1 with its gas take-off on top, and the liquor overflow at the end, and of comparatively small area, and No. 2 with its gas and liquor take-off combined at the end and of relatively large area, as shown in fig. 3—the writer formed the opinion that the pulsation of the exhauster drawing through a 6-inch opening in the end of a hydraulic main 17 ft. 4 in. long was setting up excessive oscillation in the form of waves (as in fig. 3), which jumped the opening to such an extent as to considerably diminish the quantity of liquor, which was not replaced sufficiently by the condensation from a small make of gas, thereby reducing the seals after a period of working to below that required for effectively withstanding back-pressure.

The theory was put to the test by ascertaining the depth of the seals on each dip with the hydraulic main at rest, and after working. This was done as follows: A 1-inch hole was drilled on the bridge-pipe of each retort directly over the dips, and by means of a piece of straight ¼-inch galvanized wire, bent at right angles for about an inch at one end, and well dried and chalked after each emersion, the amount of seal on each pipe with the main filled to the overflow level and at rest was ascertained within practical limits of error. Fig. 4 indicates the method adopted; and the table below gives the results obtained:—

No. 3 Bed.					No. 4 Bed.		
1	2	3	4	5	1	2	3
in. 1 1/16	in. 1 1/16	in. 1 1/16	in. 1 1/16	in. 1 1/8	in. 1 1/4	in. 1 1/16	in. 1 1/8

After working for twenty hours with ¾-inch vacuum, the hydraulic main was again brought to rest and fresh measurements taken, which resulted as follows:

No. 3 Bed.					No. 4 Bed.		
1	2	3	4	5	1	2	3
in. 1/4	in. 1/4	in. 1/4	in. 1/4	in. 5/16	in. 3/8	in. 7/16	in. 1/2

The overflow pipe, fitted with a tee, had been watched during the period, and had shown a large overflow in jerks during the first hour, but had dwindled down to the merest trickle afterwards.

The result appeared to point conclusively to the oscillation theory being correct. The writer then decided to half close the 6-inch opening, leaving ample area to act as gas take-off only, and drill a fresh 1½-inch overflow for liquor in the side of the main.

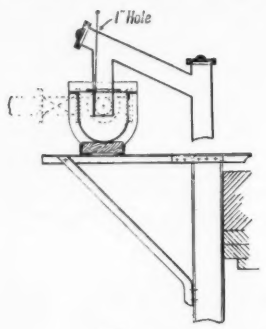


Fig. 4.

At the same time, he decided to leave no possible doubt as to the depth of seals should the trial prove abortive, and the side overflow was raised ¼-inch over the second raising, which made ¾-inch over the original; the three levels being shown in fig. 3.

The hydraulic main was then filled up to the new overflow level, brought to rest, and the seals measured, with the following results:—

No. 3 Bed.					No. 4 Bed.		
1	2	3	4	5	1	2	3
in. 1 3/8	in. 1 3/8	in. 1 3/8	in. 1 3/8	in. 1 7/16	in. 1 1/2	in. 1 7/16	in. 1 3/8

After working seventeen hours with 1-inch vacuum, the main was again brought to rest, and measurements taken which showed:

No. 3 Bed.					No. 4 Bed.		
1	2	3	4	5	1	2	3
in. 1 7/16	in. 1 7/16	in. 1 7/16	in. 1 7/16	in. 1 3/8	in. 1 7/16	in. 1 1/2	in. 1 7/16

This was maintained, and there was never any further trouble experienced by back-pressure breaking seals.

This anxious, but interesting, experience proved conclusively to the writer that the oscillation of liquor in an hydraulic main is a serious factor for which due allowance must be made in setting dip-pipe seals—particularly in small works, where retort-house governors, tar-towers, &c., were quite out of the question, where back-pressure was a real item to be reckoned with, either by no exhauster being used, or where it has to be frequently shut down for various reasons.

Even retort-house governors, tar-towers, weir-valves, and their accompanying tar draw-offs, &c., &c., are not the plain-sailing arrangements one is sometimes led to believe; and when, in addition, the great cost (comparatively speaking) and constant attention required, which cannot always be given in a small works, is taken into consideration, the writer is content to stick to the more simple form of liquor overflow with a tar draw-off, which is under control and can be operated at regular periods, rather than risk too much to automatic work.

On the score of cost, he also objects to special liquor tanks and pumps required to flush and fill up hydraulic mains, when a cheap supply of town water is available and only used at periods. Of course, to those who insist on light seals, a constant flow of liquor

through the hydraulic mains is a necessity, and town water would not pay. But does the extra 200 extra cubic feet per ton pay for the cost of tanks and pumps, and their wear and tear, and the ever-constant possibility of a failure at a critical moment? [I speak of small works.]

Apparently it is advisable to have a separate liquor overflow quite distinct from the gas take-off—at any rate, when the latter is operated from the end of a long main. The writer, however, is at present working a combined gas and liquor take-off from the side of a main with nothing like the trouble experienced with the end take-off.

Incidentally, it will be noticed that, though apparently correct as tested by spirit-level, the measurements of the seals disclosed a fall of ¼ inch from end to end of No. 2 hydraulic main. The writer is quite aware that his method of measuring the seal is open to error by reason of the capillary action of the liquid on the rod; but precautions were taken to ensure the water-mark extending as little as possible at each immersion. In any case, the results were comparative, and did not in any way upset the ultimate result. In placing this small experience before you, therefore, the writer is hoping to hear of any experiences or suggestions of members which may account for the inability to maintain the seals on the dip-pipes in the No. 2 hydraulic main, other than the oscillation theory put forward by him.

Discussion.

The PRESIDENT (Mr. C. B. Outon) said he was of opinion that the cause of the unsealing was that given in the writer's explanation—viz., the displacement of a portion of the hydraulic main contents caused the wave motion, especially as it was only noticeable in the right-hand bench, where the outlet was situated at the end of the main. He attributed the defect partly to the ⊔ shape of the main; and, as the dip-pipes were only slightly higher than the centre of the semi-circular base, when partial discharge of the liquor took place there would be a reduced area of the surrounding liquor, as a smaller horizontal chord would have to be substituted for the original full width of the cross section. Hence there would remain an insufficient volume of liquid to resist the back unsealing; and, of course, the amount of discharge over the weir would be aggravated whenever waves from separate dip-pipes synchronized. He suggested that the gas outlet should always be taken off the middle of the main, preferably at the back, and that the section of the main should have parallel back and front sides. He also thought that a more regular discharge would be obtained by ensuring the dip-pipes being always sealed in liquor, by removing the tar at a lower level. Possibly some of the surface friction at the dips could be removed by levelling-down the bottoms internally to a feather-edge to their outer circumference. Finally, he suggested the erection of a piece of vertical plate at the centre of the hydraulic main, to induce rebounding and neutralization of the wave motion. He was sure the members were all grateful to Mr. Tyndall for his valuable paper.

Mr. TYNDALL said the section he employed was the one in common use.

Mr. T. HORNBY (Longford) added a few words in approval of the paper, and said it contained much valuable material and suggestive matter in connection with the working of the hydraulic main.

UPRIGHT V. INVERTED INCANDESCENT BURNERS.

By P. J. FITZPATRICK, of Maryborough.

[A Paper read before the Irish Association of Gas Managers, July 9.]

Notwithstanding the popularity of the inverted types of incandescent gas burners for both domestic and public lighting, I am to-day of opinion that the latest and best types of upright incandescent burners are preferable in many ways. I have been a strong advocate of the inverted since its introduction, and still am; but my liking for it has not made me blind to its faults, nor made me neglect the upright form whenever I thought it preferable. In these remarks, I am dealing with burners as used with coal gas at the ordinary pressures prevailing in small towns. The introduction of the inverted burner, coupled with the fact that large quantities of cheap and inefficient upright burners flooded the market, caused a loss of attention by manufacturers to the upright burner in its various sizes, except by a few prominent firms who are still making them and improving them each year.

In the comparison of the two types, I confine myself to two points—*i.e.*, efficiency and maintenance—both of interest to the supplier and user of gas. Nowadays, I take it, no supplier of gas, no matter how anxious he may be to show an increase of gas sold, is so foolish as to supply or recommend other than the most efficient and economical burners to his consumers, in sizes to suit their requirements. The more economical they are in the amount of gas used the more we look upon them as blessings in disguise—popularizing the use of gas for lighting, which is still, despite electric light, the mainstay of our business in this country.

To be popular, a burner must be, as well as economical, easily regulated, easily cleaned, by being simple in construction, not too expensive to purchase and maintain, and give as little trouble as possible. These several requirements are fully maintained in the best classes of the upright burner, such as "Bray's" "Welsbach-Kern," and "Visso." I have had a "Visso" burner for over five months in constant use in a room some 12 ft. by 12 ft. by 9 ft. high, and it satisfactorily lights it, for ordinary domestic purposes, with a consumption of 1½ cubic feet of gas per hour. The mantle used on this burner is only about ⅜-inch diameter and 2¼ inches long. The burner, being turned out of solid brass, accurately made, and easily taken asunder by anyone for cleaning the gauze without interfering with mantle or chimney, I consider one of the most efficient I have had experience of. Its efficiency at 27-10ths pressure is 29 candles per foot of gas used (by an independent test). Makers give as efficiency 30-candle power per foot. It is made in sizes to consume ½ cubic foot to 9 cubic feet per hour; so that it is adaptable to many requirements.

Messrs. George Bray and Co. and the Welsbach Company make smaller size burners than the "C," which could be used in many small rooms where the C size is employed at present. The only objection gas companies in small towns find to this is having to stock so many different sizes of mantles. The natural way for gas to issue from a burner is upright, and burners such as Bray's reversible inverted, &c., fixed with bunsen tube upright I consider the most satisfactory of the inverted type to use. To sum up, the points in favour of the best upright forms of incandescent burners are, with best mantles placed on to fit over gauze top easily and not too loosely; good light for months under varying conditions of pressure; they may be checked-down to half consumption of gas when the full light is not required, as the bunsen air inlets do not light-back as easily as the inverted type; with broken mantle a good light may still be had (until a new mantle can be got) by slightly checking the gas or shortening the rod; the illumination of rooms for domestic or office use is more pleasant when opaline eye screens and reflectors are used; the life of the burner is longer—the average efficient life being six years (inverted burners about half this period); cheaper to purchase; mantles are cheaper. Glasses are almost standard size for all types. The points against the upright burner are: It does not give a bright illumination underneath; it is not as ornamental as an inverted burner; it cannot be used so efficiently where ceilings are low.

The points in favour of inverted burners are: They may be fitted at a height for the illumination of large spaces; they look more ornamental (for a short time); cheaper fittings may be used; they give splendid illumination immediately underneath. The points against them are: Too susceptible to changes of pressure, causing mantles to blacken by imperfect combustion; cannot be checked, as liable to light-back at bunsen air inlets; if mantle breaks, no light can be obtained until a new mantle is fitted; cost of upkeep, mantles more especially, in case of ordinary street lighting on pillar lamps not especially made for inverted burners; illumination for street lighting not as efficient; regulators, where fitted, get too hot, and the non-conducting buttons on the regulators of the best types burn away in a short time, except in the case of one burner on the market; on account of being over-heated, they soon get discoloured by products of combustion, and thereby have a shorter efficient life than the upright form; too many sizes of glasses and shades to stock.

The bijou inverted burner, although very ornamental when fitted in clusters and also economical in the use of gas, I have found most troublesome, owing to the breakage of glass and loss of light efficiency, so much so that I never fit up, or recommend, any of this size. The type of inverted burner with closed globe and inner glass also gives a lot of trouble, through the fluxing of the inner glass and explosions when lighting by inexperienced persons. I now fit this type with pear or Osram shape bulbs with better results. Bye-passes, which are efficient with the upright burner, are a constant source of trouble with vertical inverted burner, through the bye-pass tubing corroding and becoming burnt away in a short time. This fault does not, however, apply to bye-passes on Bray, Welsbach, and "Veritas" angle or swan-neck inverted burners.

Apart from the fact that some manufacturers make inverted burners requiring their own special glass-ware, we have to-day to stock for inverted burners for domestic and general use four distinct sizes of glass in their several patterns and colours—*i.e.*, bijou No. 2 or medium, No. 3 or ordinary, and the Graetzin, in two sizes. With the upright burner, "C" size fitting is almost a standard. As regards glass for inverted burners, the No. 2 medium, 2¾-inch flange fitting, and the ordinary No. 3 ($3\frac{7}{16}$-inch flange fitting) should be the only sizes used, and they would suit burners as follow: Medium size glass rings or holders fitted to bijou, bijou Graetzin, and medium (No. 2) burners; ordinary size globe fitting for Graetzin and ordinary No. 3 size. By adapting burners to take these sizes of glass, less varieties would have to be stocked; and in the case of bijou and Graetzin burners, breakage of glass would be less, there being more room for the escape of heat. I am glad to see that Messrs. Bray and the Welsbach Company, as well as some other firms, make their medium, bijou, and ordinary burners with ordinary $3\frac{7}{16}$-inch flange fitting; and their upright burners for "C" fitting only. A good many people consider the medium globes a needless introduction. I do not agree with this, although I consider the bijou size globe was. The ring fitting of mantles for ordinary No. 3 inverted and Graetzin ought to be made the same for all types. These may seem small points to bring forward; but in the busy season of winter, they, if changed as suggested, would mean a great saving of trouble to those having to attend to the maintenance of inverted burners.

I have made no mention of high-pressure inverted lighting (which, in its two distinct types, I venture to say will in a short

time become almost universal), because I have as yet had no practical experience of it; but high-power inverted lamps for ordinary pressure, as made up to the present, leave considerable room for improvement in construction to withstand the combined corrosive action of heated products of combustion and our generally damp atmosphere. I have had several in enamelled steel, and their useful life was only about two years. The inside flues corroded away, leaving the lamp body to collapse. This is very dangerous to the public, especially when hung for street lighting or over windows for shop illumination. Of course, makers supply spare renewal parts; but consumers do not like having to pay for almost a new lamp in parts after a season or two. Heavy inverted lamps ought to be made in copper with cast-iron enamelled flue linings to avoid the troubles I have mentioned. Enamelled steel, although much cheaper in initial cost, I consider more expensive in the long run.

[Since writing the above, I have received a circular letter from Messrs. Falk, Stadelmann, and Co., of London, intimating that they, too, have had experience and complaints *re* outside Graetzin lamps corroding, and are making parts which used to corrode of cast brass, &c. So it goes to show cause for my remarks.]

Although I have made so many disparaging remarks on the inverted class of incandescent burners, there are few towns of the same size in Ireland where so many are in use as in Maryborough. I regret to say that, in my opinion, they give more trouble than the best upright burners do. Yet, with all their faults, I am still an advocate for their use, except in the case of the bijou size, and the fitting of the vertical inverted with bye-passes.

I hope this rather random and very untechnical paper may open a discussion which may lead to the settlement of which class is suitable for different situations, and in general settle the question of upright *versus* inverted gas burners.

Discussion.

Mr. A. M'I. Cleland (Belfast) said the whole difficulty of Mr. Fitzpatrick's paper lay in the last two lines, because he asked the members to settle the question between upright and inverted gas-burners. They could not do this if they discussed the subject for a month, because each kind of burner had its own particular use. For instance, in dealing with certain classes of the public, and in regard to domestic lighting, it was hopeless to try to induce people to keep to gas rather than revert to electric lighting if they simply pushed upon their notice the ordinary upright incandescent burner. Consumers would simply insist on having inverted burners, because they looked like electric lights. And though this might be considered a very empty reason to give, yet they had to run with it, or else lose the custom of these people. He had no doubt that for such use as drawing-rooms—for anything but living-rooms—the inverted burner was more artistic, apart from the fact that such a burner did not blacken the ceiling anything like so quickly as the ordinary burner. But as Mr. Fitzpatrick had said, it could not be reduced below half its amount of light, and this was undoubtedly a great drawback. Of course, they could get over it by means of the "Telephos" igniter, which he could strongly recommend after two years' use. But, after all, the inverted burner in a sitting-room or bedroom was in the wrong place. In the hall, however, it was the only one to have. As for street lighting, any of those present who had compared the two burners could have no hesitation in pronouncing in favour of the inverted burner. It might be a matter of opinion, but when they had, in the case of a street-lamp, the frame of the lantern and the lamp all casting heavy shadows at the base of the lantern, and when they compared this appearance with that of a line of street lighted by good inverted burners, high up in their lanterns, he thought an impartial observer would have no difficulty in pronouncing in favour of the quality of the light derived from the inverted burner when used for street lighting. It had one drawback in the too great concentration of light at the base of the lamp, which appeared to be 30 feet from the street; and another was the absence of light on the top parts of buildings. But, from all other points of view, the inverted burner was the better one to recommend. Mr. Fitzpatrick said, with regard to the upright burner, that it did not give a bright illumination underneath, and was not so ornamental as the inverted burner. These were points that should be placed to the credit of the inverted burner, because the question of ornamentation was a very important one in the eyes of a large section of the gas-using public. He also admitted that the upright burner could not be employed efficiently where ceilings were low. Another matter, which, however, hardly came within range of the discussion on the present paper, was the case mentioned by Mr. Roberts, where he was using a single light in the Newtownards Technical School in preference to several smaller lights. He (Mr. Cleland) believed he was right in saying that the best light of a single light was not the best way of attaining the desired end in illumination, because the shadows were generally denser. In the lighting of a room, whether public or private, a better effect was given by cross shadows. When one went into a room lighted only by a single lamp, there was a sense of heaviness in the lighting; whereas two or three lights together gave such a cross-shade effect that the shadows were hardly noticed.

Mr. H. W. Saville (Drogheda) said he was pretty well in agreement with Mr. Cleland, so far as the difference between the upright and the inverted burner was concerned. But, after all, it was the consumer who had to settle the matter. So far as the average life of a burner was concerned, he had never found the difference which, according to Mr. Fitzpatrick existed between the two. Mr. Fitzpatrick had also said that while the inverted burner was more ornamental, it lasted a shorter time; but they could now get inverted burners that would stand plenty of heat. He had also said that the cost and upkeep of mantles was greater. His (Mr. Saville's) experience was exactly opposite. He always regarded it as very much less.

Mr. W. H. Roberts (Newtownards) declared that, from his own experience, he was ready to agree with Mr. Fitzpatrick on the question of inverted *versus* upright burners. The use of the former had been with him a practical failure; and he had retained the latter up to the present. But, being across the water a few months ago, he was surprised to see the various towns so well lighted; and he felt rather ashamed of himself when he made the further discovery that they were lighted by inverted burners. Then he found that his failure was not due so much to the burner as to the lamp used; and he was satisfied that any new lamps he might be inclined to put up would carry inverted burners. He should like to ask if Mr. Fitzpatrick had had any experience, in connection with inverted burners, of trouble with carbon bisulphide, such as he himself had been bothered with. It might be of interest if some one could say what was the cause of this trouble, and whether there was any way of getting rid of it. He was purifying his gas with oxide; and he had formed the opinion that, owing to its use, he was in more difficulty than if he had used lime. He had found, however, from other places where lime was employed, that they had as much trouble as he had. Mr. Fitzpatrick had mentioned that turning the gas-flame downwards was against Nature; but he thought they were working against Nature in a number of ways. For instance, they had formerly considered that by putting air in their gas they were reducing its lighting power; but now, with the incandescent mantle, they found that the more air they put in the more light they obtained from their burners.

Mr. Cleland asked leave to add to his previous remarks that he found from experience that the breakage of inverted mantles was only half what it was with uprights. He was also informed of a factory using 500 lights, where the life of an inverted mantle was two mantles per burner per season.

Mr. J. F. Tyndall (Wicklow) said the spirit of the paper was utterly opposed to his experience, and had taken him by surprise. He should like to know the pressure of the gas Mr. Fitzpatrick supplied.

Mr. J. E. Enright (Tralee) remarked that the author of the paper, in one of his opening paragraphs, said: "In the comparison of the two types, I confine myself to two points—*i.e.*, efficiency and maintenance." He (Mr. Enright) thought it was idle to argue that the upright burner was as good, as regards efficiency and maintenance, as the inverted burner. With reference to the paragraph in favour of inverted burners, he would suggest to Mr. Fitzpatrick that his trouble there, considering also what Mr. Tyndall had said, was not altogether caused by the two matters he had mentioned, but by lack of uniform pressure and quality of the gas he supplied. If they did not send out gas of uniform quality, the mantles would blacken. The same thing happened in another way when they had a greater pressure at one time than another. If Mr. Fitzpatrick would maintain a uniform pressure and quality, he would find that he would get less trouble with his inverted burners. He (Mr. Enright) had the upright burner in use; but the breakage of mantles was so great that he had to take it out, and instal the inverted burner in its stead.

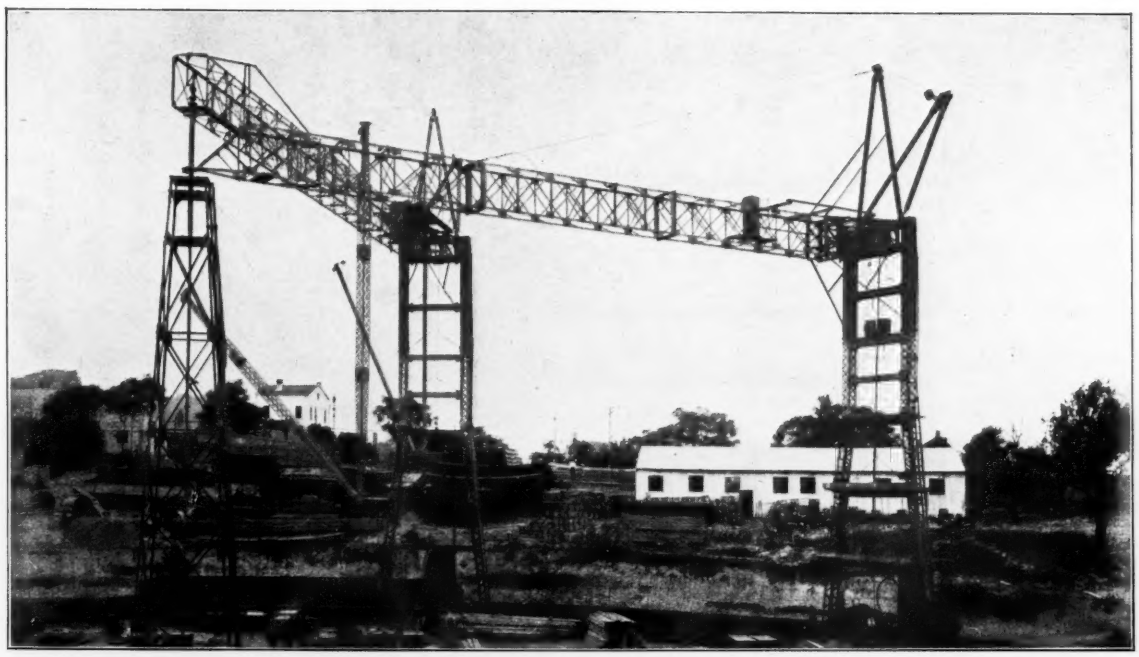
The President (Mr. C. B. Outon) said he had intended to interpose a few remarks of his own; but Mr. Cleland had covered his points. He would, therefore, content himself with giving this expression of opinion—that the recently erected lamps of the inverted burner type throughout the Dublin streets would prompt one to think that they were far more effective for general street lighting than anything secured before by the upright mantle. On behalf of the members, he desired to convey their best thanks to Mr. Fitzpatrick for his paper.

Mr. Fitzpatrick, in reply, said that collectively the members who had spoken had convinced him that inverted burners were the best—that was to say, where they had properly constructed lanterns in which to put them. If they were obliged to use them in old lanterns of the type that they had in Maryborough, they would find they would not do very well. The working pressure at which they sent out gas in Maryborough was 20-10ths, and the illuminating power was about 17 candles.

Protection of the Eyes from Ultra-Violet Rays.—In a note in a recent issue of "Nature," on the proposed substitution of electric for gas lighting in the House of Commons, doubts were expressed as to the necessity for placing the lights behind amber-coloured glass in order to guard against the effects of ultra-violet light on the eyes. This view is confirmed by a paper by Dr. Louis Bell in the "Proceedings" of the American Academy of Arts and Sciences, in which he records the results of a series of measurements of the amounts of ultra-violet light sent out by various artificial lights per candle power. The quartz mercury arc in its diffusing globe sends out the fewest, and the carbon arc enclosed in quartz the most, ultra-violet rays per candle power. But the numbers for these artificial sources are far exceeded by that for daylight. Our contemporary remarks that, in these circumstances, it seems unnecessary, within buildings, to protect eyes which prove themselves hardy enough in the daylight outside.

AMERICAN GASHOLDER CONSTRUCTION.

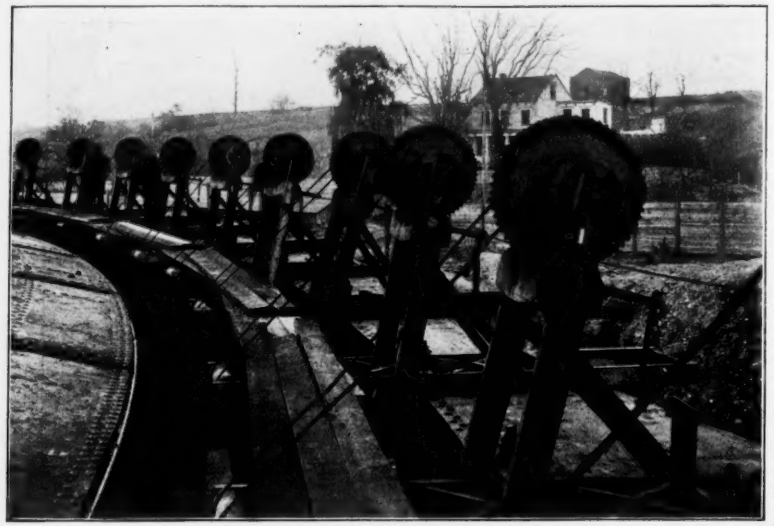
[See p. 244.]



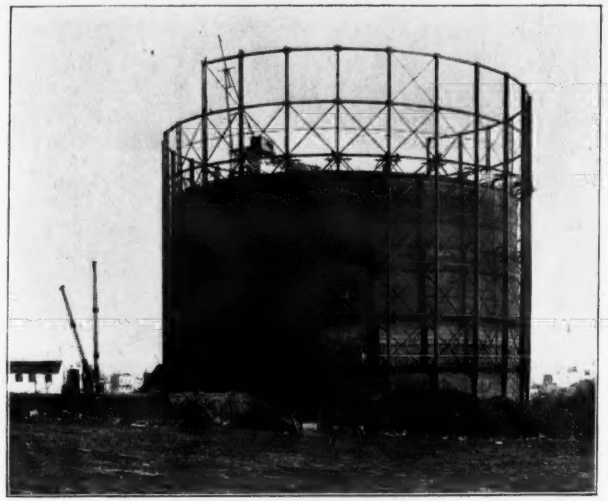
The Newtown Gasholder—Showing the Radial Travellers Beginning Work on the Second Course of the Tank Shell.

Newtown Gasholder—Showing the Hydraulic Pneumatic Rivetting Machine at Work on the Seventh Course of the Tank Shell.

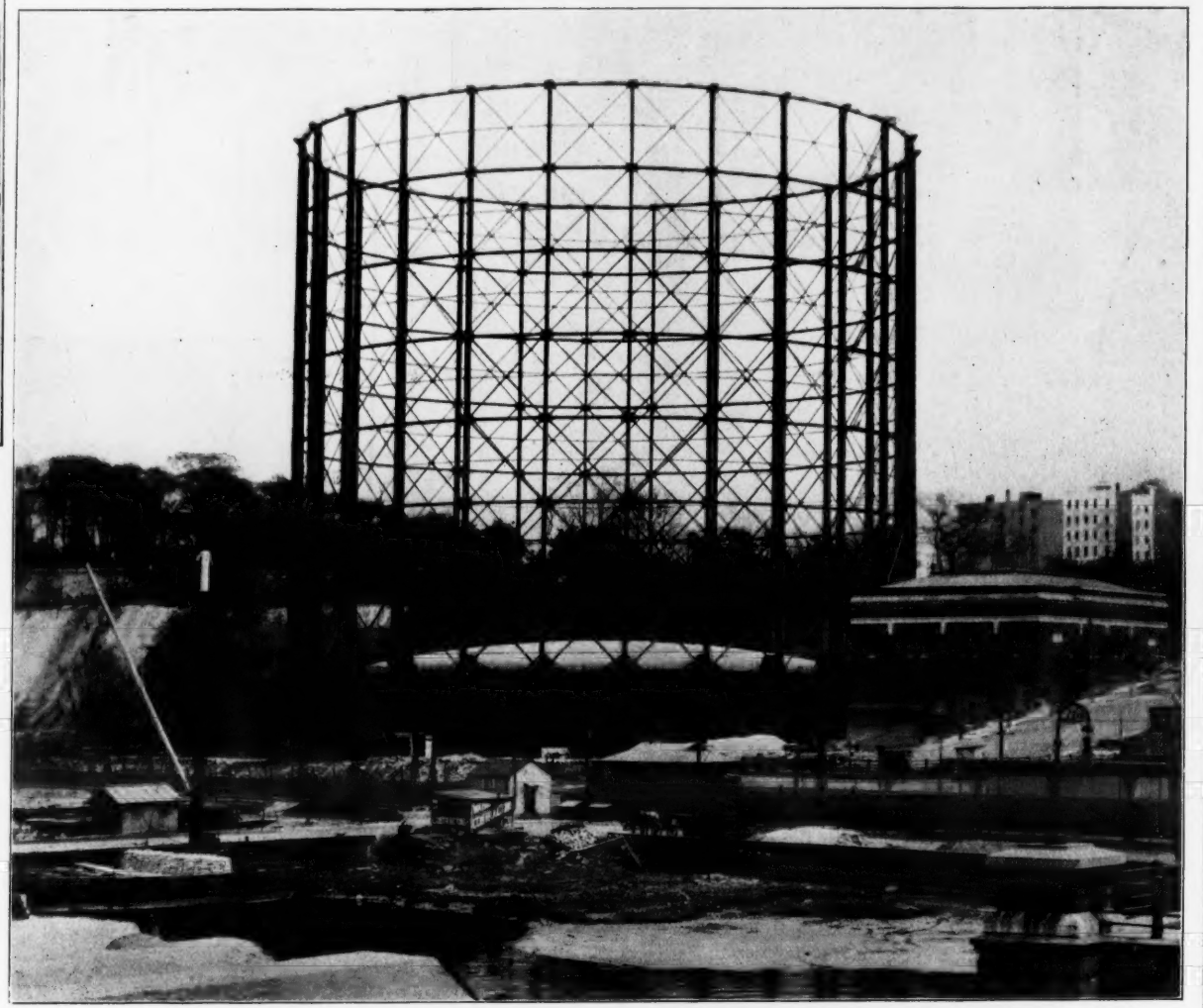
Kingsbridge Gasholder—Showing the Rivetting Machines Suspended from Trolleys at Work on the Holder Sections.



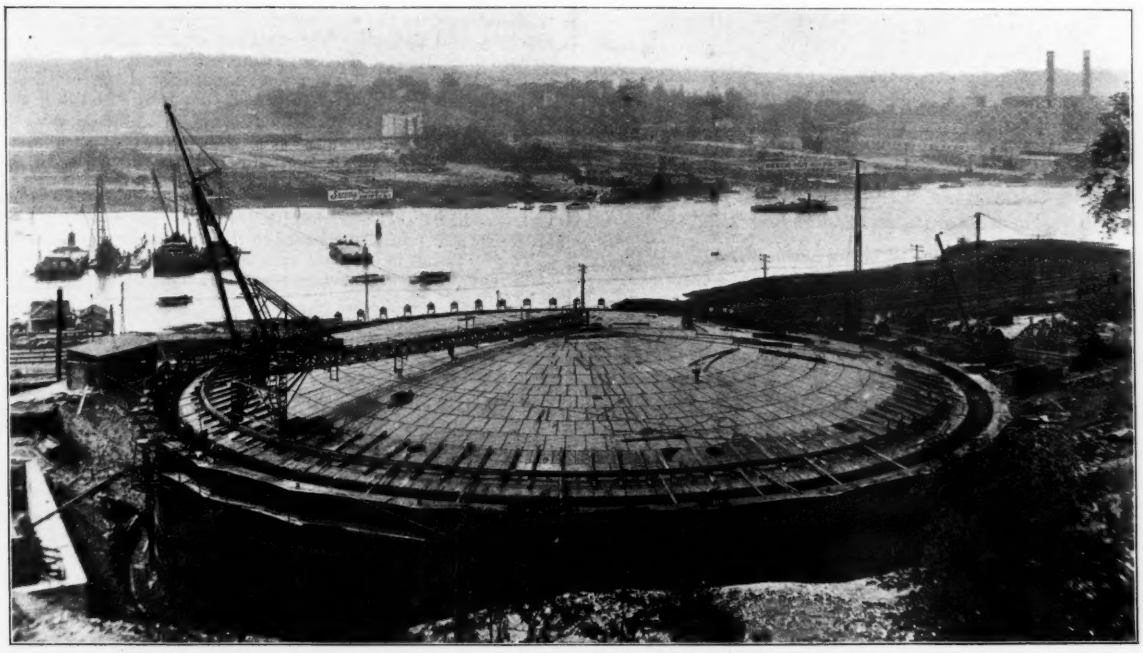
Newtown Gasholder—Showing the Special Hoisting Drums in Position for Lifting the Holder Sections.



Newtown Gasholder—Showing the Radial Traveller Erecting the Sixth Tier of the Guide Frame.



The Kingsbridge Gasholder Completed—The Unfinished Building alongside is the Governor House.



Kingsbridge Gasholder—Showing the Radial Traveller in Position for Beginning the Erection of the Guide Frame.

THE NEW HAND PHOTOMETER.

In the "JOURNAL" for the 25th ult. (p. 970), an illustrated description was given of a new hand photometer devised by Mr. W. J. Dibdin, F.I.C., F.C.S., and manufactured by Messrs. Alex. Wright and Co. It was brought under the notice of the members of the Society of Chemical Industry, at the meeting of the London Section on the 17th ult., in a short paper submitted by Mr. Dibdin, the text of which is given in the current issue of the Society's "Journal," from which it is reproduced.

In 1884 I described to this Society the radial photometer which was designed for testing the light emitted by any radiant in all directions, instead of horizontally only. That instrument was intended for use in the laboratory; the useful intensity of the light for street lighting, &c., being calculated from the data thus obtained. The developments which have taken place in public illumination since then call for more direct methods which can be used when the illuminants are permanently fixed in position. Various more or less admirable instruments have been devised; but the author ventures to submit his new form of a hand or portable photometer which enables all the work done by the radial photometer and its many modifications to be carried out with the facility and accuracy which are so essential in the present-day practice of the photometrist.

The instrument now submitted weighs only a little more than 6 lbs., and measures only 17 in. by 5 in. by 5 in.; and it can be used either in the hand or supported in any way desired.* It is designed to embrace three important conditions: (1) Maximum open-scale readings; (2) convenience and accuracy in comparing lights of different colours; and (3) reliability by reason of the facility with which its indications can be checked. The open-scale readings are obtained by the employment of an electric incandescent lamp, the current to which from the storage cell is regulated by means of a specially wound rheostat which gives an unusually lengthy movement of the contact point, the position of which is read off a scale graduated in terms of foot-candles; and consequently more delicate graduations of lighting power can be measured than by direct readings of the voltmeter, with which the instrument is nevertheless fitted as a means of checking the working of the storage cell supplying the current. The facility for comparing lights of different colours is secured by the use of the author's improved form of Leeson's star disc.

The following comparative results were obtained in the course of a series of simultaneous readings by two observers—one using a high-class standard instrument, the other a hand photometer.

Standard. Foot-Candles.		Hand. Foot-Candles.	
0·20	0·23	0·20	0·22
0·26	0·38	0·25	0·38
0·30	0·17	0·26	0·18
0·17	0·61	0·15	0·60
0·23	0·30	0·20	0 30
0·21	0·67	0·20	0·65
Aver.	0·31	Aver.	0·30

* For illustration, see "JOURNAL" for June 25, p. 970.

To ascertain the illuminating power of any radiant, the square of the distance, measured in feet, from the photometer disc is multiplied by the foot-candle power observed. As the instrument now shown will indicate up to 12 foot-candles, a light at 25 feet distance giving this degree of illumination on the photometer disc would have an intensity of 7500 candles; while if the foot-candle power at this distance was only 0·001 candle (the lowest for which the instrument is calibrated), the initial intensity would only be 0·625. Thus the range of the photometer is wide enough for all ordinary purposes; but it is obvious that, by modifying the power of the battery and lamp, or by using a reflector, still greater variations could be obtained without altering the essential features of the method.

In the discussion upon the paper,

Mr. J. H. COSTE said the author's radial photometer marked a great epoch in photometry. It had been used in various forms for the useful comparison of lights. If one wanted to read a book on a table, it was not of much advantage to know the horizontal component of a light above the table, because none of it would fall on the printed surface. It was very useful, therefore, to have an arrangement which could be sighted at the source of light at any desired angle, and which would measure the intensity of the light emitted at this angle. The modification of Leeson's star disc afforded a very much better comparison than the ordinary bunsen grease-spot disc for lights of varying colours. In fact, when examining incandescence mantles he had found that each new man when he started work looked at the two lights—the standard pentane flame and the mantle light—and said that any exact comparison was impossible; but all obtained accurate results almost immediately. It was gratifying to see the many great advantages of this instrument. A direct comparison could be made of the normal rays falling on the disc, instead of a comparison based on the so-called sine law, which was not of very general application. For the comparison of lights in rooms and streets, this little apparatus would be most useful.

Mr. JACQUES ABADY, as a rival worker in the same field, confirmed what had been said about the accurate results which, with care, could be obtained by this instrument. Mr. Coste had touched upon an important point which should not be absent from any instrument, however simple it might be, and that was the facility which one had for standardizing any part of it. It was based on such a fundamental principle that the electric lamp could always be checked by comparison with a standard one-candle at one foot from the disc. One could cut out the resistance at a different point, until there was a light equal to one candle one foot from the disc; and by this means one could always check the accuracy of the photometer. One had only to establish once for all the curve for the relationship of candle power to the drop in the voltage; and, from experience of a large number of experiments he had made, he was prepared to say that the curve would remain constant, though the cutting-out point would move down as the normal efficiency of the lamp varied. Thus the instrument was excessively simple, and at the same time capable of being checked and used in an accurate manner at any time. Of course, it was not strictly correct to call it a photometer. The eye was the photometer; but it was not really capable of comparing one light with another without calling in some external aid, such as Mr. Dibdin had devised.

RATING OF WATER UNDERTAKINGS.

As mentioned in the report of the proceedings at the recent annual meeting of the Institution of Water Engineers at Cheltenham given in the "JOURNAL" for June 11, two of the papers submitted dealt with the rating of water undertakings—one being by Mr. DONALD DINWIDDY, F.S.I., and the other by Mr. ARTHUR VALON, Assoc.M.Inst.C.E. These papers are given below, with some notes of the discussion upon them.

RATES AND TAXES ON WATER-WORKS UNDERTAKINGS.

By DONALD DINWIDDY, F.S.I.

The item "Rates and Taxes" is one of the heaviest, if not the heaviest, in a water company's annual expenditure; and the methods of arriving at the assessments upon which the rates are levied are somewhat complicated.

The *raison d'être* of the law of rating is the need of an equitable system of raising money for the relief of the poor, and for public services. The foundation of the existing law is the Statute of Elizabeth (1601), which first outlined a system which, though gradually developed and modified, has stood for upwards of three centuries. That Act authorizes the churchwardens to tax every inhabitant and occupier for the relief of the impotent. The parish is still the unit of area; but parishes are now grouped into unions for the purposes of poor law administration.

In recent years, there has been, in some quarters, much criticism of the inequality in the incidence of rating and taxation, and the fairness of estimating the ability to contribute on the basis of the annual value of the inhabitants' property. Even though we were a new country, the author suggests that no more equitable basis could be found than "annual value;" but when it is remembered that property has been bought, sold, and rented, with the full knowledge of the charge of rates levied upon it, for three centuries, he can see no hardship in its continuance. This vast controversy is, however, wholly outside the scope of his paper.

DEFINITIONS.

Not until the Parochial Assessment Act of 1836 was passed was any endeavour made to lay down a uniform code for rating every property throughout the country. By this Act the basis of assessment ("net annual value") was defined as "the rent at which the hereditament might reasonably be expected to let from year to year free of usual tenants' rates and taxes and tithe commutation rent-charge (if any), and deducting therefrom the probable annual average cost of the repairs, insurance, and other expenses (if any) necessary to maintain them in a state to command such rent." By an Act of 1862, gross estimated rental was defined as "the rent at which the hereditament might reasonably be expected to let from year to year free of all usual tenants' rates and taxes and tithe commutation rent-charge (if any)." These are the definitions of gross estimated rental (generally called the "gross value") and net annual value (generally called the "rateable value") of every hereditament appearing in the valuation lists throughout the country to-day, with the exception of the Metropolis. The wording of the definitions in the Metropolis Valuation Act, 1869, which governs the procedure in London is slightly different, though their purport has been held to be the same.

GENERAL PRINCIPLES.

With this preface, the author will now proceed to discuss how to find the gross and rateable values of water-works undertakings in each parish in which the several parts may be situated.

Water authorities are occupiers of land—firstly, where the water is obtained, collected, and stored; secondly, where their trunk mains convey the water from the sources to the reservoirs and to the areas of supply; and, thirdly, by the ramification of mains and pipes which carry the water from the trunk mains to their customers. The first two categories are technically called "indirectly productive," while the third is called "directly productive."

It appears that before 1783 it was not the practice to assess water-pipes; but in 1813 they were held to be rateable. This decision was disputed in 1826, 1833, and 1859, but in every instance without effect. It is at once obvious that while a house or a shop, though not let at a rent, may be compared with other houses or shops which are so let, and the annual value may thus be obtained, no such assistance is available to enable a valuer to estimate the rental value of such an undertaking as a water-works. We are therefore driven to other methods.

We will first deal with water-works belonging to a trading company for private profit—leaving for later consideration the cases of water-works under municipal control.

WATER-WORKS COMPANIES.

It cannot be gainsaid that if a man were negotiating for the tenancy from year to year of such a water-works undertaking, the predominant, if not the sole, question he would ask himself would be: "What profit could I make out of the concern?" Having answered this question, he would proceed to ask: "What rent could I afford to pay out of the profits in order to recoup me for the capital that would have to be invested, for the risks that would have to be incurred, and for tenant's profit?" always remembering the undertaking is a parliamentary monopoly.

This, then, is the accepted principle in the assessment of a water undertaking worked for profit; and the first step is to ascertain the rateable value of the whole undertaking by starting with the gross receipts, and deducting the working expenses (including rates), repairs of chattels, and tenant's share—the balance being the gross value. If the estimated average annual cost of repairs, renewal, and insurance of the hereditament be deducted, the balance is the rateable value of the whole undertaking.

The next procedure is to assess the wells, springs, gathering-grounds, or other sources of supply, the reservoirs, offices, trunk mains, and other "indirectly productive" portions, to the parishes in which they are situated; and the balance (being the rateable value of the "directly productive" or service mains) is apportioned to the various parishes *pro ratâ* to the revenue earned in each.

The following is a specimen valuation of the assessment of a water company's undertaking:—

Gross receipts from water and meter rental, supplies in bulk, and other sources of revenue, less losses and bad debts		£2839
Working expenses, including repairs and renewals of meters and other chattels, but excluding rates and repairs of the hereditament		936
		£1903
Tenant's share—		
Profit, interest on capital, and risks at 10 per cent. of the gross receipts (£2915)		291
		£1612
Statutory deductions—		
Repairs, maintenance, and renewal of the buildings, machinery, reservoirs, mains, and other destructible portions of the hereditament		400
Rateable value, *plus* rates, entire undertaking		£1212
Rateable value of the works, reservoirs, offices, and trunk mains	£500	
Actual rates thereon, at 3s. 6d. in the pound	87	
		587
Rateable value, *plus* rates, service mains		£625

Total of rental apportioned to the parishes, £2839.
Rateable value, *plus* rates, service mains = 22 per cent. of rental.

Apportionment to Parishes.

Parish.	Property.	Revenue earned in the Parish.		Rateable Value.
A.	Service mains	£2715, at 22 per cent. =	£597	
	Rates at 7s. 6d. in the pound		163	
			£434	
	Offices		20	
				454
B.	Service mains	£64, at 22 per. cent. =	£14	
	Rates, at 3s. 9d. in the pound		2	
			£12	
	Reservoir and trunk mains		206	
				218
C.	Service mains	£60, at 22 per cent. =	£13	
	Rates, at 3s. 4d. in the pound		2	
			£11	
	Well and pump-house, reservoir, and trunk mains		248	
				259
D.	Trunk mains			26
	Total rateable value of the entire undertaking			£957

I will now deal with each item of the valuation.

The gross receipts and working expenses should be the actual amounts appearing in the latest accounts, unless some exceptional occurrence happened in that year, such as, on the one hand, an increment in revenue due to some unusual sale of water, or, on the other, an exceptional drought, in either of which cases earlier accounts should be looked at. In short, if the preceding year's working was one which, through any cause and in the light of previous years, was not likely to be so good or so bad in the next year, a reasonably minded tenant would look at more than the preceding year's working, in order to determine the net revenue which he would expect to receive for the year to come. In a water-works undertaking, the revenue and working expenses are, however, comparatively stable; and it is seldom necessary to depart from the last year's accounts. It must also be remembered that outside the Metropolis the ratepayer (or the rating authority) can require (or make) a new valuation for every rate. There is field for expert estimate in the allowance for repairs, maintenance, and renewal of the tenant's chattels (including meters), as to which the actual expenditure may have been less or more than it ought to have been; and an estimate is often necessary on the same lines as the estimate for "statutable deductions" referred to hereafter. This allowance is, however, of no great moment in a water undertaking, because the value of a tenant's chattels is not large.

The tenant's share is the rock of contention in rating valuations of water-works and analogous undertakings; and the author will, at the risk of repetition, try to explain its reason and purport. As we are finding the rent which the hypothetical tenant can afford to pay out of his profits, the following questions arise: How much will he deduct for himself before deciding his rent? What capital has he to find upon which he will require interest? What risks does he take beyond those annual expenses which are already allowed in the working expenses? What profit should he expect to keep for himself?

This hypothetical monstrosity or imaginary tenant which "case

law" has set up, is supposed to come into occupation on a given day with an empty till and depleted treasury. He therefore has to lay down capital sufficient to take over from the outgoing tenant the meters (at their present depreciated value), perhaps some fittings let out on hire, office furniture, loose plant, and tools. He would have to take over or provide a stock of coal and other tenant's stores (not the landlord's stores for repairs or extensions), and find a cash balance at his bankers. He would also have to find enough money to pay wages and current working expenses, buy coal and other stores, and pay his rates, until he recouped himself sufficiently by receipt of his water-rentals.

The author has known it contended that the tenant would require his capital enhanced by a quarter's rent, on the assumption that the landlord would exact this payment before any water-rentals had accrued; but he has always considered this claim far-fetched, because the landlord would not be so insane as to insist on the punctual payment of his quarter's rent, when it would mean a reduction of 17½ per cent. upon a quarter's rent—*i.e.*, a reduction of nearly 4½ per cent. from the annual rent. Surely he would rather give the tenant a few weeks' grace to enable him to collect sufficient money from his consumers, out of which he would pay his first quarter's rent.

The real question to be answered is: What amount of profit would suffice to induce the hypothetical tenant to take the hereditament at the proposed rent? If the necessary tenant's capital were £100,000, something less than 17½ per cent. would induce him to pay a given rent; but if the capital the tenant would require were only £1000, the prospect of making 17½ per cent. thereon out of the same net receipts would not be sufficient inducement to him to become liable for a much larger margin of rent. To give an amusing example, a toll bridge would be rated on its profits; and the only capital that a tenant would require might be a Windsor chair. Could it be contended that a tenant would only require 17½ per cent. upon the value of the chair?

In a gas or a railway valuation, the calculation of the amount of tenant's capital is all-important; but in the case of a water company, it is generally—and the author thinks reasonably—considered that even the full 17½ per cent. upon the capital required by a hypothetical tenant is insufficient to tempt him to accept the liabilities for which he must be responsible. In a small undertaking such as the example given, another basis has therefore to be found for the tenant's remuneration; and the author thinks that 10 per cent. upon the gross receipts is by no means excessive. We then escape the necessity for a valuation of tenant's capital. It is, however, different with a large concern such as the Metropolitan Water Board, with a revenue of £2,750,000, where, no doubt, the full 17½ per cent. upon the capital required would be more than ample temptation for the tenant to take the financial responsibility.

Statutable Deductions.

This term is by Statute defined as "the probable annual average cost of the repairs and insurance and other expenses necessary to maintain them in a state to command such rent;" and it has been held [R. *v.* L.B. & S.C.Ry., 1851], and always admitted, that this includes a fund to renew any property of a perishable nature. Care should therefore be taken to omit from the working expenses all items of repairs and renewal to the property (apart from repairs and renewals of chattels), and to include such expenses under this head.

The life of the several parts of the undertaking is a very important factor; but this question may be left to the author's friend, Mr. Valon, who is presenting a paper at this meeting. The author, however, ventures to set out the lines upon which an estimate of repairs and renewals should be based.

(1) *Repairs.*—The actual average expenditure upon repairs (eliminating renewals) of the property. If, however, the expenditure be proved to have been insufficient, and the repairs are in arrear, an estimate is permissible; and, in any case, no improvements, extensions, or other expenditure of a "capital" nature may be included.

(2) *Renewals.*—An estimate of the amount required to be set apart annually to provide, at compound interest, and on a given number of years' "life," a sum of money sufficient to renew the several parts of the undertaking at the termination of their "lives." As to the rate of interest, of course, the higher it is the more will the annual fund accumulate to in the given number of years, and consequently the less annual sum will be required in order to accumulate eventually to the given capital sum. A safe investment must be found, if in these days any investment may be called "safe." Consols at current prices yield 3¼ per cent., and county and municipal stocks yield from 3½ to 3¾ per cent. The intermediate rate (3½ per cent.) would therefore now appear to be more correct than the 3 per cent. that used to be claimed.

Rates.

These are, of course, part of the working expenses, and should be calculated upon the rateable value ultimately found by the valuation, and not upon the accident of the existing assessment.

Apportionment.

Having found the total rateable value, *plus* rates, of the entire undertaking, we have to apportion it among the several parishes in which the works and mains are situated. If we deduct the aggregate rateable value of all the "indirectly productive" works, offices, &c., and trunk mains, *plus* the rates to be paid upon them, we have left the rateable value, *plus* rates of the "directly productive" service mains.

The manager of the undertaking must prepare a division of the water-rental into the several parishes supplied; and the rateable value, *plus* rates, of the directly productive service mains is apportioned to each parish *pro ratâ* to the division of the revenue. The actual rates in the pound have then to be allowed upon the rateable value finally found in each parish; and we then get the rateable value of the directly productive mains of each parish.

It may save some thought if the author gives the mathematical formula for this last calculation. If the rateable value, *plus* rates, is multiplied by the number of pence in a pound and divided by the number of pence in a pound *plus* the number of pence in the rate, the result is the rateable value. Thus—

R.V. *plus* rates . . . £734 × 240 ÷ 330 = £534 R.V.
Proof.—R.V. . . . £534 at 7s. 6d. = 200

R.V. *plus* rates = £734

This is the academical method of dealing with the rates, as it gives effect to the axiom that the higher the rates the less will a tenant give in rent. We, however, often have to put our case before a body of gentlemen who are not used to intricate figures; and if the average rates upon the new valuation are deducted, and the actual rateable value is apportioned to the several parishes, without the complication of differential parish rates, the calculation is more easily understood, and the result is a fair approximation to the truth. If there be any tithe payable, it should be deducted [see the definitions above quoted]; but it is not allowable to deduct land-tax, property-tax, rents, interest upon mortgage or other capital, or landlord's charges.

Works.

As already explained, the method of determining the rental value of the works and trunk mains is essentially different from the valuation of the service mains. Again, there are no rents to aid a valuer in determining the rent which a tenant would pay; and we are driven to look rather on the other side of the picture, and ask ourselves what rent a landlord would expect to get as a return (in the form of a percentage interest) for his capital sunk in the works. If he has laid out his capital unwisely—say, in wells, yielding an insufficient supply—the landlord must be the loser, as the tenant cannot be expected to pay interest on more than the effective value of the works or the cost of replacing them. The utmost net rent which a landlord could expect would be 5 per cent. upon replacement or effective value; and this is the usual scale adopted in an undertaking where the entire rateable value provides sufficient margin for a proper balance for service mains. The Metropolitan Water Board's works are assessed on this basis. Where, however, the rateable value of the entire concern represents less than 5 per cent. upon the replacement or effective value of the entire hereditament, it would be unfair to parishes containing only service mains if this full scale were allotted to the works. Indeed, it may be said no tenant could pay, and no landlord could reasonably expect, the full rent of works to supply an undertaking which was not earning sufficient profits to pay the full interest upon the whole concern.

As a general rule, it is to the advantage of the water undertaking that the works should be assessed to the hilt, as it follows that the higher they are assessed the less will be the balance for service mains; these being usually situated in the town, where rates are high, while the works are generally in the country, where low rates prevail.

The question "What is a trunk main?" is not of much moment, so long as every parish adopts the same basis of valuation. The Metropolitan Water Board accept all mains of and over 6 inches diameter as trunk mains, with the consequent reduction of margin for service mains. The distinction between trunk and service mains is rough and unscientific; but this is the basis now generally adopted.

It must not be forgotten that the company's offices must bear their quota of the entire undertaking. Workmen's cottages and a manager's house are sometimes provided by the company rent free, and considered as partly in lieu of wages and salary; and they should also be treated as being "indirectly productive," and included in the deduction to arrive at the rateable value of the service mains.

Municipal Water-Works.

At one time it was held that land occupied by public bodies for the benefit of the public, and from which no private profit accrued, had no beneficial occupation, and was not rateable. This doctrine has now been swept away by many decisions—such as the Mersey Docks case and the Dartford Sewage case (quoting the earliest and the latest) and many others; but the question of how such undertakings are to be rated is still unsettled. As corporations frequently charge lower water-rentals than a trading company, the question arises whether, in rating a corporation, the actual profits or the profit which might be made if the undertaking were in the hands of a trading company should be brought into account.

Mr. Walter Ryde, K.C., in his lucid text-book, answers this question thus:

> A local authority may make lower charges than a company, either voluntarily or under the compulsion of a Statute. In the former case, it may be said that the local authority do not diminish the value of their property, and that they can no more claim a reduction of their assessment than the occupier of a house can claim such a reduction on the ground that he does not make full use of all the rooms. But where the charges which the local authority can make are limited by Statute, it

is said that this is a restriction attaching to the property, and that the hypothetical tenant must take it subject to these restrictions.

In the Droitwich case, the Court of Appeal, in 1876, decided that, in rating water-works occupied by a local authority who were restricted by Statute from charging more than sufficient to maintain the works, the local authority could be assessed only with reference to the profits actually earned. In the Stamford case (1883), the Peterborough Corporation had expended £17,500 on works in a parish outside their area; and because the receipts were restricted by Statute to a sum insufficient to pay the expenses, the balance being made good out of the borough rate, it was held, on the authority of the Droitwich case, that the rateable value of the works was *nil*. It is very doubtful if these decisions hold good to-day, as they are inconsistent with many later cases; and since it has been held by the House of Lords [*West Kent Sewerage Board v. Dartford*, 1911] that "sewers were rateable wherever the occupation of them was 'valuable' within the meaning of authorities dealing with rating," and therefore a sewer from which no private profit could possibly accrue is held to be "valuable" (and therefore rateable), how is it possible that water-works, even though no private profit accrues, as in the Stamford case, can be rate-free?

While profits are the only motive which will induce a trading company to become a tenant, there are other motives which would induce a local authority to become a tenant of water-works. The local authority are not, therefore, ruled out as a possible tenant (and there is ample legal authority for this statement); and it may probably be assumed in some cases that no tenant other than the local authority could be found. The question is then narrowed to this: At what rent might the water-works be expected to be let to the local authority? To answer this question we must ask: What would it cost them to purchase water-works equally suitable for supplying their district with water? Having ascertained this figure, we may calculate what rate of interest they would be willing to pay upon the capital value, instead of finding the capital necessary to purchase or construct the undertaking. This would be the rateable value; and this method has the full approval of the Courts. This is known as the "contractor's test"—that is, the interest on cost which a contractor would require if he provided the land and buildings for their present occupier. It must not be what the contractor would demand, but what he would be likely to get.

In the case of *Liverpool Corporation v. Llanfyllin Union* (1899), which related to the Vyrnwy reservoir, the Corporation constructed a reservoir in the Welsh mountains; and the execution of the works involved the submersion of a parish school, church, and vicarage. The Corporation made new roads and bridges in substitution of roads diverted, and provided sites for, and built, new schools, church, and vicarage in substitution for those that were submerged. On the hearing of an appeal against the assessment of the reservoir dam and other works, both sides agreed that interest on capital value must be the basis of calculating the rateable value; but it was disputed whether the cost of new roads, bridges, schools, church, and vicarage were to be brought into account as part of the capital cost. The Quarter Sessions decided that all the expenditure ought to be included in the capital cost; and the Court of Appeal held that there was nothing wrong in law in the decision, and upheld the following valuation:—

Cost of land		£62,250
Reservoir and works		646,932
Substituting schools, church, and vicarage		13,952
New roads		55,939
Bridges		8,337
		£787,410
Full capacity	52½ million gallons	
Catchment area capacity	41 ,, ,,	
Present requirements	26½ ,, ,,	
Effective value (26½ ÷ 41) thereof		= £508,935
One-third cost of tunnel		9,312
Effective value		£518,247

Rateable value at 3 per cent., £15,322.

The Corporation were able to borrow at 2½ per cent.; but the Court fixed 3 per cent., because, in consequence of the greater demand for such sites and the increased cost of labour and materials, the value was greater than the cost.

Rate of Interest.

While in a commercial undertaking from which private profit accrues a maximum of 4 per cent. on land and 5 per cent. on buildings and plant may be taken as representing the rateable value, a public body would not pay rent on so high a rate of interest, because they can borrow, on the security of the rates, at a much lower percentage. In applying the rate of interest, the Courts appear to have adopted two alternative lines—either (1) cost price of interest to the local authority upon the actual total outlay, including the ghosts of schools, &c., in the Liverpool case; or (2) a higher rate of interest upon a lower capital value called "replacement" or "effective" capital value. These two lines may not be inconsistent.

Works in Excess of Requirements.

If it can be proved that some part of the capital expenditure has been incurred for future requirements, and not for existing use or to provide a reasonable stand-by in cases of emergency, the works should not be rated to the full extent of their capacity or capital cost, but some deduction from the capital expenditure should be made [*vide* the South Staffordshire case in 1885, and the Liverpool Corporation case in 1899].

Springs and River Intakes.

As long ago as 1813, and as recently as 1902, the Courts have held that springs and intakes are to be assessed at the ascertained local value to the parish where they are situated.

Decisions Affecting Rates and Taxes.

The author will now pass from general principles of valuation and apportionment, and consider some particular enactments and decisions affecting the item "Rates and Taxes" in the revenue account.

District Rate.—By section 211, sub-section 1 (*b*), of the Public Health Act, 1875, "the occupier of any land covered by water" shall be assessed in respect of general district rate "in the proportion of one-fourth part only of such net annual value thereof;" and the House of Lords held, in the case of *Hampton Urban District Council v. Southwark and Vauxhall Water Company*, that an open reservoir artificially constructed came within this definition.* Subject to Local Acts amplifying or curtailing this partial exemption—and the author has found several—reservoirs situated within urban areas are thereby entitled to this concession on the district rate. By section 230 of the same Act, reservoirs situated within rural areas are entitled to the same concession upon special expenses rate; but the latter rate is generally small. It is undecided whether covered reservoirs are "land covered by water" and entitled to this concession; but, in the author's experience, the exemption is generally conceded. Water-mains are, however, not entitled to the concession; neither is it applicable to the Metropolis, as the 1875 Act does not extend to London.

Property-Tax.—This may be levied on Schedule A; but the author believes that in water-works carried on for profit—*i.e.*, in the hands of a company in contradistinction to a municipal water-works—the Surveyor of Taxes levies the tax upon Schedule D (shareholders' dividends) in place of property-tax (Schedule A). Property-tax on Schedule A does, however, on occasions, vitally affect public authorities, as it has somewhat anomalously been held that the income-tax charged upon the interest on municipal stock is not deductable from Schedule A (property-tax), though the capital obtained for the stock may have been expended in money constructing the undertaking.

Gross Value.—This is of little concern to a water-works undertaking, and the rateable value is the only figure upon which any material levy is made. The gross value is therefore but a means to find the true figure for rateable value; and, in the author's judgment, the Legislature should never have confused the rating authorities and the ratepayers by ordering this duplication of figures in the valuation lists.

Land-Tax.—This tax originated from certain ancient feudal duties, and was made perpetual by Parliament in 1797. The aggregate amount due from each parish is fixed in perpetuity; and this quota is divided among the owners of property liable to the tax *pro ratâ* to the annual value. By the Finance Act, 1896, the tax may not exceed 1s., nor may it be less than 1d., in the pound. The tax may be redeemed, both as to the quota payable by the parish and as to the amount payable in respect of a particular property. It has been held [*Chelsea Water-Works Company v. Bowley*, 1851] that a water undertaking is not liable to be assessed to the land-tax for the land occupied by its pipes.

Objection against Assessment.

Any person who wishes to have his assessments reduced, or who claims not to be rateable, must serve "Notice of Objection" on the Union Assessment Committee and on the Overseers of the parish. This objection is heard by the Assessment Committee; and if they grant satisfactory relief, the claimant may rest content, because the Assessment Committee must notify the Overseers of the amendment, and they must revise the current rate accordingly. Notice of objection to a rate may be given at any time within the currency of a rate based upon the list against which a claimant is objecting; and he may appear before the Assessment Committee in person or by agent. Should the objector be unfortunate enough to fail to get relief, he can appeal to the Petty or Quarter Sessions; and either party may impugn the decision of Petty Sessions by appealing to Quarter Sessions within fourteen days. As, however, in the event of appeal, it is necessary to go to a solicitor, the author need not pursue the procedure further. It should be noted, as a means of preventing confusion, that one "objects" to the Assessment Committee, and "appeals" to the Sessions.

THE RATING OF WATER UNDERTAKINGS.

By Arthur Valon, Assoc.M.Inst.C.E.

Judging from the opinions one hears expressed upon the subject, there seems to be a widespread impression that the assessment of undertakings such as water-works to the poor rate is conducted upon some mysterious and esoteric principles impossible of general comprehension. Some of the decisions given by Quarter Sessions upon appeal certainly tend to strengthen such an impression, which perhaps in some cases is shared by the occupants of the Bench. Be that as it may, the fact is that the basic principle upon which an undertaking is assessed is simplicity itself. The rateable value of an undertaking is the rent at which it would let

* See "Journal," Vol. LXXIV., p. 1380.

from year to year, free of all usual tenant's rates and taxes and tithe commutation rent charge (if any) and deducting therefrom the average annual cost of the repairs, insurance, and other expenses (if any) necessary to maintain it in a state to command such rent. That is to say in general terms, the rateable value is the net rent which the landlord would receive from a yearly tenant after paying the cost of repairs and maintenance.

If water-works were let on a yearly tenancy, there would be obviously very little trouble in arriving at the correct rateable value; but as these undertakings are usually owned and worked by the same body, which is therefore both landlord and tenant, the rent which the undertaking might be expected to fetch must be calculated. It is these calculations that have given the question of valuation its reputation for complexity; and, to a certain extent, it must be admitted, justly so. All the figures involved in an estimate of rent are, no doubt, matters of fact. But, in the absence of direct evidence, the figures adopted are frequently based on opinion; and it is notorious that opinions, expert or not, differ.

The Parochial Assessments Act, 1836, lays down that—

> No rate for the relief of the poor in England and Wales shall be allowed by any Justices, or be of any force, which shall not be made upon an estimate of the net annual value of the several hereditaments rated thereunto—that is to say, of the rent at which the same might reasonably be expected to let from year to year, free of all usual tenant's rates and taxes, and tithe commutation rent-charge, if any, and deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses, if any, necessary to maintain them in a state to command such rent.

The Valuation (Metropolis) Act, 1869, states—

> The term "gross value" means the annual rent which a tenant might reasonably be expected, taking one year with another, to pay for an hereditament, if the tenant undertook to pay all usual tenant's rates and taxes, and tithe commutation rent-charge, if any, and if the landlord undertook to bear the cost of the repairs and insurance, and the other expenses, if any, necessary to maintain the hereditament in a state to command that rent. The term "rateable value" means the gross value after deducting therefrom the probable annual average cost of the repairs, insurance, and other expenses as aforesaid.

Preparing the Valuation.

Most of the information required for an estimate of rent can be obtained from the accounts of an undertaking, and in the majority of cases the chief differences of opinion that are likely to occur will be in respect to the questions of the tenant's share and repair and maintenance. The tenant's capital, in the case of a water undertaking, bears a very small proportion to the magnitude of the business, owing to the water-rates being payable in advance. It is therefore not very easy to settle the tenant's share by taking a percentage upon the tenant's capital. The responsibilities for rent and other matters being so much greater than those for the safety and return upon the capital employed, the tenant's share would be determined in relation to the magnitude of the former rather than in relation to the amount of tenant's capital; and so the tenant's share is frequently calculated as a percentage upon the total gross receipts of the undertaking.

The cost of maintaining the hereditament referred to in the Acts is the cost of maintenance which would fall upon the landlord; but, in addition, there is also the ordinary maintenance costs which would fall upon the tenant. These would form part of his ordinary working expenses, and must be allowed for in arriving at the rent which he could afford to pay. The items in the accounts which cover the cost of repairs and maintenance include both landlord's and tenant's expenses, and the total amount has therefore to be separated—the tenant's maintenance being included in the working expenses, while the cost of maintaining the hereditament is deducted from the gross estimated rental. This separation is usually effected by dividing the total maintenance in some arbitrary proportion—a favourite division being two-thirds and one-third. Whether or not this proportion is correct is not very material if the tenant's share has been arrived at by taking a percentage on the gross receipts, as it will not affect the final rateable value. But if the tenant's share has been calculated by taking a percentage upon the tenant's capital, the division becomes important; and a fairly close investigation must be made into the nature of the works which have to be maintained, and the probable annual average cost.

From the wording of the Acts, the cost of repairs and maintenance to be allowed must be the average amount necessary to be expended in order to maintain the hereditament in a state to command the rent. This involves two things—first, that the deduction for repairs and maintenance is to be the expense necessary to keep the works in the condition to earn the rent which it is assumed can be obtained. If, therefore, the works have had insufficient maintenance, and this has affected the rent which could be obtained, it is not permissible to assume that a higher rate of maintenance is proper, unless at the same time allowance is made for the increased rent which could be obtained if this higher rate of maintenance were adopted. The second point to be observed is that the allowance for repairs and maintenance is to be the average annual cost. In many cases of statutory trading undertakings, it is possible to estimate the average annual cost of maintenance by taking the average amount expended during five or ten years; allowance being made for any alteration in the magnitude of the undertaking, if this has taken place.

In the case of water-works this method may be misleading. The cost of maintenance includes the cost of renewal, and the renewal of a great deal of the plant on a water-works takes place at very long intervals; so that by taking an average over a comparatively short series of years, it is improbable that a fair average of renewal has been allowed for. Under these circumstances, it is safer to exclude from the accounts the renewals of plant and buildings which only take place at long intervals before finding the average, and then to make an allowance for these by forming a sinking fund to meet the renewals as they become necessary. This renewal fund is calculated in the usual way—*i.e.*, by taking each separate class of apparatus and structures, assuming a probable life, and finding what annual payment would be required in order to furnish the proper value at the end of that period. The author thinks the following represent fair lives to adopt in average cases:—

Engines	40 years
Boilers	25 ,,
Buildings and chimney shafts	80 ,,
Mains and valves on works	60 ,,

With the increasing rapidity of inventive progress, it becomes more and more difficult to estimate the fair life for different types of machinery. In the case of water-works, this is not, perhaps, so serious a difficulty as with many other engineering works; but it must always be remembered that the "life" of a piece of apparatus may end long before it is physically worn out, by its becoming obsolete and requiring to be replaced by more modern plant. Reservoirs and filter-beds require renewing only at such very long periods that the annual payment into the sinking fund makes very little difference in the rateable value, and is hardly worth considering; but if the style of structure is not substantial, it might be necessary to include these also.

Apportionment of the Rateable Value.

After the rateable value of the whole undertaking has been determined, there still remains what often proves to be the chief bone of contention—viz., the apportionment. It is very seldom that a water undertaking is wholly situate in one parish, and therefore, as each parish is entitled to rate the part which lies within it, it is necessary to divide the rateable value of the whole between the various parishes in proportion to the rent which would be expected for each part of the undertaking. This involves the separation of what is called the indirectly from the directly productive portion; the latter being those mains from which water is directly supplied to the consumer, while all other mains and the works form the indirectly productive portion.

The division of the rateable value between the indirectly productive works and mains and the directly productive mains is made by assuming the rateable value of the indirectly productive portion to be equivalent to a certain percentage upon its structural value. It was assumed, when this principal was first adopted, that it would be necessary to pay a rent equivalent to the market rate upon the amount which a contractor would have to expend in providing the necessary indirectly productive works and mains. In order to determine this amount, a structural valuation must be made. But before discussing this question of structural value, it may be as well to point out that when this principle (which is called the "contractor's test") was adopted, it would seem to have been on the assumption that the total rateable value, when divided in this way, would give a higher rate of return on the directly productive mains, in relation to the structural value of these mains, than the market rate on money invested; and that as these directly productive mains were situate in the parishes where the profit was earned, it was only right that what may be called surplus rateable value should belong to these parishes. It is not suggested that this view was ever definitely put forward; but it certainly seems to be involved in the arguments which were employed for the "contractor's test." There appears to be very good reason in the contention; but difficulty arises when the total rateable value bears a less proportion to the total structural value than the market rate in relation to the money expended. When this occurs, either the directly productive portion will have a less rateable value in proportion to its structural value than the indirectly productive, or the rateable value of the indirectly productive part must be obtained by some modification of the "contractor's test." The fairest way of dealing with the matter would seem to be to take the total rateable value of the whole undertaking, and divide it between the directly and the indirectly productive part, in proportion to their structural values.

Structural Value.

In dealing with the question of structural value, conflict of opinion sometimes arises as to exactly what this means; and the term is very often confused with structural cost. The two things may, but do not necessarily, coincide. The structural value is required in order to divide the rateable value of the undertaking into two parts. By the Acts, the rateable value has to be fixed in relation to rent, and therefore the rateable value of each part of the undertaking must conform to the principles laid down in such Acts. If it is assumed that the rateable value may be determined by taking a percentage upon the structural value, this percentage will represent the rent which a tenant would pay for that portion of the undertaking, after deducting the cost of repairs and maintenance. It would then seem clear that the structural value must be the value for which a tenant would be willing to pay rent. As stated above, this value may be equal to the original cost; but unless the works happen to have been recently constructed, this

is unlikely to be the case. What a tenant requires is works to provide and distribute to the consumers the requisite amount of water to enable the business to be carried on, and to make the profit expected; and the rent he would be willing to pay for such water-works would be governed, not by the actual amount of money expended upon the works, but upon the amount it would be necessary to expend in order to provide the requisite works at the time the valuation was made. It has sometimes been suggested that a valuation thus arrived at is not a valuation of the works in existence, but of something which the valuers say should be in existence. The author suggests that this is not the case, but that the value thus found is the actual value for letting of the actual water-works in existence. This value is, of course, affected —indeed, is governed—by the cost of obtaining other plant and apparatus of equivalent efficiency.

An Example.

To take the example of water-works which obtain their water from a river, and distribute it after filtration. The works will consist of land, the intake from the river, reservoirs for storing water before filtration, filter-beds, engines and pumps, boilers, buildings to contain them, mains and valves on works, workshops, offices, covered service reservoirs, and indirectly productive mains.

Land and Intake.—The value of the land and intake will depend to some extent upon the general value of land in the neighbourhood, and also upon the number of alternative sites which would be suitable for the purposes of the water undertaking. Where a particular site has special advantages, the tenant would naturally be willing to pay a higher rent for this land than for other land without these advantages; while if the site was the only possible one, then, of course, the value of the land would rise to a maximum for water-works purposes.

Reservoirs and Filter-Beds.—If the reservoirs are suitable for the purposes of the undertaking, they should be valued at the cost to construct them at the time the valuation is made. If the construction is unnecessarily expensive, then the value would not be so great as the cost, and some allowance must be made. But great care requires to be exercised in modifying cost in this way, and consideration must be given to the exigencies of the site and to difficulties which may have been met with in construction. In many instances, the water-works, in their present state, are the result of gradual extension from small beginnings; and it will often be found that the reservoirs, had they been set out and constructed at the present day, would have been fewer in number, larger in size, and built at a less cost. When this is so, the value of the existing reservoirs is limited by the cost of the more convenient, larger, and cheaper reservoirs.

Very much the same remarks apply to filter-beds as to open reservoirs, except that in this case increase in the size of the undertaking does not always mean increase in the economical size of the individual filter-beds.

Pumps.—The different sizes and types of pumps in use make their valuation a matter of some difficulty. Opinions differ very much as to the most economical type of pump to use under particular circumstances. When, therefore, a pump is modern, and there is likely to be reasonable difference of opinion as to whether any other type would have been equally suitable and cheaper, it is usual, and certainly proper, to value the apparatus at the cost necessary to provide it at the present day. There are, however, a large number of pumps still doing good work, but which were put in many years ago, and certainly would not be replaced at the present day by pumps of similar type. In such cases, the value of the apparatus is only equal to what it would cost to instal pumps of equal efficiency of a modern type. If the pumps which would be installed now would be of higher efficiency, then their installation would—other things being equal—raise the rateable value of the undertaking; and it would seem proper that the increased rateable value due to their higher efficiency should be attached to the pumps, or that portion of the undertaking which includes the pumps. Therefore, the effect of retaining the old pumps would be to reduce the rateable value and the structural value upon which the rateable value depends.

Boilers.—As a general rule, it will be sufficient to value the boilers at the cost to replace them with similar boilers at the present time. Occasionally a modification must be made where old-type engines are in use, and a long range of low-pressure boilers would be replaced with a smaller number of high-pressure ones. Such modifications must also be allowed for when dealing with the buildings. The cost of buildings with the old-type beam-engine was very high, and where such engines would not be used now, but would be replaced with a type of engine requiring much less expenditure on the buildings, the value of the existing engine-houses would be much below their original cost.

Buildings.—The buildings on water-works are sometimes of a much more ornamental character than is usually the case with industrial structures; and the question arises as to what, if any, increase in the structural value of the buildings should be made for the cost of this ornament. It has at times been said that no tenant would pay more for an ornamental building than he would for a perfectly plain one, so long as it was convenient for its purpose. There seems to be a good deal of force in the argument. But how far is the argument to be extended? There is always some expenditure upon appearance; and is such expenditure to be ignored altogether in making the valuation? The author would suggest that it is perfectly reasonable to allow some expenditure upon appearance to increase the structural value. Water-works are very often in such a position that buildings must be made presentable for the sake of the neighbourhood. They are often, in many cases, in the hands of local authorities, when they become to some extent public buildings; and, in any case, it is to be hoped that, in the future, there will be a constantly increasing demand for improved design in utilitarian structures. This is not to say that where money has clearly been expended extravagantly, it should be added to the structural value. When this is the case, it will generally be found that the appearance of the building has not been improved to the extent of the expenditure.

Covered Reservoirs.—The valuation of covered reservoirs follows in principle that of open reservoirs. Here, of course, the modern developments in covered reservoirs—the use of reinforced concrete, and the consequent general lightening of structures—will affect the value of the old massive type of construction.

Mains.—The value of the mains will be the cost of laying similar mains at the time that the valuation is made, except in those few cases where a main has been duplicated, not for any advantage of the duplication, but simply for an enlarged supply, and where, had one main of a capacity of the two smaller ones been laid, the cost would have been less. In valuing mains, the cost of laying forms part of the value, and will vary according to the depth of the main, the style of road surface, and so on. If, subsequently to the laying of a main, the road surface is altered, the value of the main will also automatically be altered.

[The author explained at the close of his paper that, in view of the fact that Mr. Dinwiddy would probably deal with all the purely rating questions, he had endeavoured to confine his attention to the points involving engineering as well as rating experience; and he apologized if, in consequence of this, his communication presented a somewhat disjointed character.]

Discussion.

Mr. E. J. Silcock (Westminster), who had been obliged to leave the meeting, had written a contribution to the discussion, which the Secretary (Mr. Percy Griffith) read. He said that the authors of the two papers so fully described the principles of rating usually adopted that little room was left for controversy; but he should like to emphasize the importance of applying the "contractor's test" to all indirectly productive works owned by corporations, water boards, and other bodies not working for profit. In the present day, when the vast majority of water undertakings were the property of the ratepayers, the total net revenue derived from such works should not necessarily be taken as a correct basis of their earning power. It was true that most corporations liked to make a profit on their water department to hand over in relief of the rates; but it could not be gainsaid that the general scale of water charges under corporations was lower than that for similar works managed by companies. Moreover, it would obviously be to the interests of a corporation whose non-productive works were situated outside their own rating area so to adjust their water charges that little or no profit should be made, if these were the only bases upon which they were to be rated to the outside authorities. It must, he thought, be conceded that the maximum rent that a hypothetical tenant would pay for any water-works could not exceed a sum which would give a fair return on the capital invested if he constructed works for himself; and, on the other hand, it was inconceivable that any capitalist would invest his money in building works unless there was a fair prospect of finding a tenant willing to pay a rent which would yield him a proper rate of interest on his investment. Under these circumstances, it seemed to him (Mr. Silcock) that the contractor's test must be the most equitable basis to apply to indirectly productive works, whether or not a profit was in fact made from the whole concern; but, on the other hand, that if there was any excess of rateable value available it should, after satisfying the contractor, be divided among the directly productive works *pro ratâ* to the revenue earned in each parish. While holding this view, he quite recognized that the principle must be applied with some discretion, and that there were cases in which the cost of works must be carefully scrutinized before accepting it as an infallible guide to rateable value. As an instance, he mentioned the case of *Keighley Union v. Bradford Corporation*, where the question of assessing a large impounding reservoir arose. The outlay on this reservoir had been excessive, on account of the unforeseen difficulties of the site, with the result that the cost per million gallons of water stored was upwards of £1000—a figure which was almost unprecedented. Clearly this reservoir would not command a higher rent than a similar one of normal cost. The Justices took this into consideration in fixing the rateable value; and this decision was upheld on appeal. Then, again, as had been pointed out by Mr. Dinwiddy, in cases where works were constructed greatly in excess of present requirements, the rent might be less than if the works were more fully used; but in such a case, he apprehended that if there were more than one customer for the water—*i.e.*, if there were competition—the hypothetical tenant might be expected to pay the full price for works which were not fully utilized by the present owners, on the ground that he could sell the surplus water to the other possible customers. Then there was the question of excess expenditure on ornamentation. This could never be a matter of much importance on large works;

but he recently had an experience in his own practice, when valuing the Lincoln Corporation Water-Works, of a somewhat elaborate elevation to a pumping-station, for which a deduction was duly made when settling the valuation. Turning to the details of the papers, he ventured to think that the life of forty years given by Mr. Valon for engines and pumps was rather on the high side. It depended, of course, upon the type of engine used, speed, margin of power, management, and other considerations. But, having in view the fact that machinery often became obsolete before it was worn out, he thought the average life would be more like thirty than forty years. With regard to the rate of interest on structural value, he was inclined to think that the actual rate of borrowing was not the true test of rateable value, but that the rate of interest for similar security at the time the assessment was made would be a more appropriate figure. It was true that when money was very cheap, as in the late nineties and in the first year or two of the present century, large corporations and water boards could borrow at a very low rate of interest. But, on the other hand, when money was dear, they had to pay more for the accommodation; and if present structural value was used as a measure of capital expended, it would appear only fair that the present rate of interest should be assumed on the capital. He thought there must be an error in Mr. Dinwiddy's paper, where it was stated that the Metropolitan Water Board's works were assessed on a rateable value basis of 5 per cent. on replacement value. Surely, for so large an undertaking, the net rateable value must be based upon a lower rate of interest. In conclusion, he quite agreed with Mr. Dinwiddy in his suggestion that the introduction of the gross value into the valuation lists was a totally unnecessary proceeding, and one which frequently led to trouble. If the difference between the gross and rateable values was insufficient, the appellant could accept the gross value, and claim, and often secure, a greater deduction for statutables; or, on the other hand, if the gross was too high, he could accept the deduction, but get the gross reduced. In both cases, the net result was that the assessment might be made too low.

Mr. W. Jones (Pontypridd) said the members were probably all agreed that annual value was perhaps the best basis that could be devised for rating purposes. The difficulty was how to arrive at it. Was it to be based on profits, or on rents calculated by reference to profits? If this were so, a concern not making a profit should not be rated; but as they knew, this proposition would not stand. The point that the rateable value of water-works usually bore a high proportion to the rental was very noticeable when comparing a water concern with a gas concern. The reason was that, water not being a manufactured product like gas, the working expenses, and consequently the tenant's capital, were less. He believed that the landlord's average repairs were often included in the tenant's working expenses, instead of being shown as "statutables." This could not be objected to if the tenant was required, by the nature of the repairs, to pay for them *pro tem.* The point was that, by including the item of "tenant's working expenses," the tenant's working capital, and consequently the proportion of profits, was increased, and the rateable value correspondingly decreased. It was interesting to note that in Scotland large water concerns were assessed by a Government Railway Assessor. There were important differences in practice to which he would refer later. The valuation was made every year. The author of the first paper did not say how the 17½ per cent. allowance was made up. He believed the allocation was: Interest, 5 per cent.; trade profit, 10 per cent.; risks and casualties, 2½ per cent. He quite agreed that this figure should not be a hard-and-fast one, though he believed it was now almost generally followed, whatever the local circumstances might be. In Scotland, corporations had not got any such allowance; and consequently the assessments were much higher than the corresponding ones in England. Since 1875, the Scottish Courts had held that as water-works owned by corporations were statutorily precluded from making a profit, the deduction was not admissible. The author suggested 3½ per cent. as the interest for the renewal funds investment; but he (Mr. Jones) thought one needed to be careful in adopting a high rate in connection with investments which for long-lived assets might have to run from twenty to forty years. Though money was tight now, who knew what might happen in twenty years' time? Regard must be had, too, to the cost of investment, and inevitable delays in re-investment. In getting at the "value" of works to apply the "contractor's test," it was interesting to observe how experts differed. Works provided out of revenue should be included. This showed how important it was that all work of a capital nature should come into the capital account even though it was paid for direct out of revenue; otherwise it might be merged in revenue and lost sight of. It was important that a concession should be obtained in respect of works of surplusage. The ideal water-works were always from ten to twenty years ahead of present requirements; and this fact should not be overlooked in fixing the rating assessment. That reservoirs should be rated at one-fourth for district rate purposes seemed eminently reasonable. But why should the concession be confined to reservoirs? and why should it not extend to the poor and other rates? The water undertaking did not increase the poor's requirements. The laying of water-pipes did not, as a rule, reduce the rateable value by interfering with the cultivation of the soil. The water-works required no police protection, lighting, or drainage. With regard to the apportionment of the rateable value between parishes, he had observed that in the case of the Metropolitan Water Board the gross receipts were taken. The King's Bench Division said that net receipts might be a better test where practicable; but in this particular case the respondents had not put before them any other practicable method of arriving at the valuation than gross receipts. On the evidence, it was impossible to ascertain what the expenses were in any particular parish, apart from the whole, except on hypothetical calculations based on no accurate facts. In Scotland, since 1884, the apportionment between parishes had been in proportion to the amount of money that was expended on the works in each parish; no difference being made between a revenue producing and non-revenue producing parish. In England, no percentage allowance was now made for depreciation of water concerns for income-tax purposes. Repairs and renewals were allowed to be charged, as they arose, against profits; and if the profits in any year were not sufficient to cover (say) a large renewal, the deficiency might be carried forward against future profits, like unallowed depreciation under section 26 of the Finance Act of 1907. With regard to corporation assessments, he thought the sinking fund should be allowed as a deduction from the gross receipts in arriving at the assessment.

Mr. H. Francis (Plymouth) remarked that there was no mention in either paper of the expense incurred in getting an Act of Parliament passed; but he thought it should be added to the outlay for the works.

Mr. H. C. Head (Winchester) thought Mr. Dinwiddy's allowance for the tenant's share was inadequate. There was one point with regard to objections—rather outside the scope of the paper—to which he should like to allude. Any ratepayer had the right to object to an assessment. Therefore, if a water-works seemed to be assessed too low, any ratepayer in the parish where they were situated could object; and, what was more important from the water-works point of view, there was the same power with regard to the assessment of any other property in the district. This was most important in the case of municipal property, because a company might be asked to supply water on a low rateable value as stated in the assessment lists.

Mr. C. Clemsha Smith (Wakefield) thought that the doctrine of "ability to pay" was being worked for all it was worth at the present time, and that more attention should be paid to the question of value received. He said he knew of a case where, in connection with water-works, rates amounting to about £900—one-third of the total rateable value of the district—were paid, while the actual amount of work done in return would not be more than £9 a year or a hundredth part of what was paid. He appreciated the difficulty of rating on any other basis than that now prevailing; but it did seem to him that the present principle operated unfairly towards water undertakings.

Mr. A. B. E. Blackburn (Sunderland), alluding to the remarks made as to percentage, said in the case of his authority only 9 per cent. was allowed. At the present time, the question of rates and taxes was becoming a serious one for large water undertakings, as the rates were constantly increasing. In the case of his own Company (Sunderland and South Shields), they amounted to 1d. per 1000 gallons of water pumped.

Mr. N. J. Peters (Cardiff), alluding to the question of the cost of meters, said he could quite understand that it might be regarded as capital expenditure. This would be the case more particularly with municipal undertakings. He should like to know if either of the authors could give any information as to the course usually adopted with regard to the payment of rates in parishes to which water was supplied in bulk.

Mr. Dinwiddy, in reply, said Mr. Silcock had described the "contractor's test" basis as the best to adopt. He (Mr. Dinwiddy) ventured to say it was the only one. How could a valuer go to the reservoirs at Cheltenham and say what they were worth? What would a tenant give for them? There was no method on which a valuer could have any figures except the replacement value. Mr. Silcock questioned his figure of 5 per cent. being the percentage on which the Metropolitan Water Board's works were rated. He knew for a fact that this was so. He had dealings with about two-fifths of the Board's works, and the whole of them were assessed on the basis he had named. Where they had a flourishing concern like the Water Board, they could afford to allow the full rate of interest on the structural value of the works; and then they had a margin for the mains. How they split up the value between works and mains was important, but not comparatively so. It was certainly desirable, in the interests of an undertaking, to get as much as possible on the works, because these, as a rule, were situated in country parishes, where rates were low. In one case he knew the rates on the works were only 3s. 6d., and on the mains 7s. 6d. He was glad to hear Mr. Jones's remarks; and he accepted his contention that the sinking fund should be calculated at 3 rather than 3½ per cent. The point raised as to the difficulty of reinvesting money annually was a very good one. Though 3 per cent. used to be a constant scale some ten years ago, when Consols yielded something just under 3 per cent., it would appear, on the face of it, that there should be a rather higher rate of interest to-day; and he thought the rate should be about 3½ per cent. A comparison between the assessment of gas and water undertakings would be very interesting. The latter were usually assessed at a higher rate in relation to the gross revenue than gas undertakings. In the case of the Metropolitan Water Board, the rate was 40 per cent.; whereas in gas undertakings he did not think it would be more than 30 per cent. in any case, and in many it would run down to 25 or even 14 per cent. Generally the comparison was to the disadvantage of

water undertakings, for several reasons. All the capital outlay was landlord's, upon which rent must be paid; whereas in the case of gas, a great quantity was laid out in tenant's capital, on which no rent was paid. Expenses were in similar ratio. In the case of water, there was not much annual expenditure; whereas in the case of gas the article had to be manufactured. The consequence was—and he thought it was reasonable—that the water should bear a higher ratio of rent to revenue than gas; certainly it always did so in his experience. Another point raised by Mr. Jones was with regard to income-tax. Income-tax was not deductable as working expenses; and he had mentioned this in his paper. With regard to the 17½ per cent., he wished to reiterate his statement that it was not a fixed rate. Every undertaking should be dealt with on its own footing; 17½ per cent. might be too high, and it was often held to be so. Referring to the other method, of taking a percentage of the gross receipts, he thought 10 per cent. on small undertakings was too low. It was very difficult to get away from practice and custom and to ask for more than 17½ per cent. As to the point referring to the cost of the Act of Parliament enhancing the value of reservoirs and waterworks, he thought it would in many cases be rather straining it to include the cost of the Act. Mr. Head raised an interesting point when he remarked that the owners of a water undertaking could object to any assessment in their district. He (Mr. Dinwiddy) knew of a case where this had been done, not only with the object of seeing that other people were rated up to their full quota, and in the same ratio as water undertakings, but also—what what was essentially important—to discover whether the rates were levied on the assessable values as they appeared in the lists. Mr. Blackburn stated that his undertaking was allowed 9 per cent.; but this depended a little upon the magnitude of the undertaking. In the case of the Metropolitan Water Board, the valuer asked for 8 per cent. of the gross receipts, the revenue being something like £2,750,000; but Mr. Blackburn's undertaking was not, of course, so large as that. It was merely a question of comparison.

Mr. BLACKBURN: My Company has one million capital, with £100,000 of revenue.

Mr. DINWIDDY said he thought 9 per cent. was too low in that case. Mr. Peters raised a point about meters. Of course, they would be bought out of capital. But this was no reason why they should not be renewed out of revenue. With regard to the supplying of water in bulk to other parishes, the hereditament would not belong to the supplying authority, because it would not be in the occupation of land in the parish being supplied, and therefore could not be rated.

Mr. VALON said he thought Mr. Dinwiddy's last point might be enforced a little more. The answer would depend a good deal upon whether they took the supply just to the boundary of a district, or whether they took it to a meter or valve house on the other side. Mr. Silcock suggested that the "contractor's test" was the only one that should be applied to all undertakings which were not working for profit. He (Mr. Valon) thought most people were of this opinion now; but it all depended upon whether this was the proper way of arriving at an estimate of the rent which any possible tenant would pay for the undertaking. An undertaking was not rateable because it was possible to make a profit from it, but because it was possible to have beneficial occupation. A water authority might even elect, for hygienic purposes, to give away its water; but this again could not possibly prevent the undertaking from being rateable. Then the question arose as to what rent the authority would pay for the undertaking if they did not own it. They would not always pay interest on the total amount expended, because in many cases a certain proportion had been spent in order that the authority might enjoy the benefits of ownership, and not those of occupation. Therefore the part which was expended for this purpose did not increase the amount which the authority would pay in rent. If there were any abnormal cost, which would not be incurred again, that would not increase the rent either. Mr. Jones raised a point, with which Mr. Dinwiddy had not dealt, about repairs properly chargeable to the tenant. If the tenant did repairs, it was suggested that he should have 17½ per cent. on his outlay, in which case the landlord's statutables would be higher. As to the figure of 17½ per cent. being usually followed, he did not think it was now. A point was raised as to the Metropolitan Water Board being assessed at 5 per cent. on the structural value, and 4 per cent. for land and the indirectly productive portion of their undertaking. The appointment of a Government valuer had been suggested by Mr. Jones; and he (the speaker) had been inclined to favour the proposal. But supposing such a valuer took a different view of the rating of water-works from that held by Mr. Jones, possibly the latter would not like the idea so well. He (Mr. Valon) was not sure that it would not be better for each side to put its views before an impartial tribunal, which could then determine what the value should be. He agreed that by such means they did not always get the result they liked; but he did not think it was right to condemn the decision because it was different from what was expected. With regard to the criticisms of his views on the question of the life of mains and valves, there had been some misconception, as he was referring only to large mains and valves. Quite small service mains were, of course, different; but he thought sixty years too long a period to allow for mains and valves in ordinarily good ground, where they were not being constantly taken up and replaced. Each case must, of course, be dealt with on its merits.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Alliance and Dublin Consumers' Gas Company.

SIR,—The question which now presents itself is how otherwise than in capital ratio does this Company compare adversely with British companies.

Failure to correct the capital expenditure in past years must necessarily severely overshadow other factors, because, whether the revenue account is administered efficiently or not, this bugbear of high capital ratio remains. As I have previously stated, this handicap represents 18s. 2d. per 1000 cubic feet of gas sold, or nearly 10s. per 1000 cubic feet more than five well-known Suburban companies, whose ratios vary from 6s. 9d. per 1000 cubic feet to 10s. 3d. per 1000 cubic feet of gas sold, or a mean over all of 8s. 5·2d. But, allowing for an excess of 10s. per 1000 cubic feet, the penalty should not be more than 3d. or 4d. extra per 1000 cubic feet; whereas the selling price of gas at present is 3s. 4d. and the net rental last year realized 37·74d. per 1000 cubic feet sold, against 27·03d. for five Suburban companies, and 28·21d. for three Metropolitan companies—a difference of (say) 10d. per 1000 cubic feet.

Now, why is this extra revenue required, if other matters are satisfactory? Why should the consumers of Dublin pay 10d. per 1000 cubic feet more for their gas? And, equally, why should the stockholders be at present penalized by only receiving 5 per cent. dividends, when they are quite entitled to £5 7s. 6d. based on the present selling price? Furthermore, if the Dublin Company could be brought into line with either the Metropolitan or the Suburban companies, whose average gas-rental for 1911 was 28·21d. and 29·29d. respectively, how much better off would the Dublin consumers be at (say) 2s. 6d. per 1000 cubic feet, and the stockholders with dividends increased to £6 12s. 6d. per cent.? Under the sliding-scale, the two points are inseparable—the price of gas and the rate of dividend.

This agitation concerns the interests of gas consumers in Dublin equally with the general body of stockholders. Therefore let us, in a later issue, make further comparisons with the Company's affairs before summing up one's remarks. Meanwhile, I hope such stockholders as are taking an interest in this matter will add to the agitation, and retain their proxies to either support an independent stockholder, or themselves attend the next stockholders' meeting to lodge an emphatic protest at the unsatisfactory state of affairs. I feel convinced that at least two Directors should be nominees of British stockholders. But of this more anon.

July 18, 1912. NONULUS.

High-Pressure Gas Systems.

SIR,—We should feel obliged if you would allow us some little space for our comments on the paper, entitled "Some Notes on High-Pressure Lighting," by Mr. A. M'I. Cleland, in your issue of the 16th inst.

The statement of his private opinion—in reply to Mr. Outon's query as to the relative merits of the two systems, "Keith and Selas," on p. 189—is very misleading. In arriving at a conclusion that 60 candles per foot with gas at 54 inches pressure was nearer the mark than 50 candles with air mixed with gas before being consumed, Mr. Cleland clearly shows that he has had no experience with small units of about 100-candle power. Otherwise, he would have been familiar with the fact that no compressed gas system could substantiate the claim of 60-candle power per cubic foot of gas consumed for lamps yielding the above-mentioned candle power. Analyzing his own figures on p. 186, and bringing them to a common standard of candle power per 100 square feet illuminated, we find that, although the Keith figures show 108 per cent. more candle power than the Selas, the actual illumination per 100 square feet is only 17 per cent. greater with Keith as against Selas. But to get this extra 17 per cent. illumination, 75 per cent. more gas had to be consumed. On the face of this, we hold that Mr. Cleland should have been more careful in the choosing of his answer.

For the benefit of the members of the Irish Association of Gas Managers, we would like to point out that, although we maintain a standard of 50 candles per cubic foot of gas consumed with our small unit lamps, the results obtained with Selas for 500-candle power and upwards are equal to any other high-pressure system on the market, which confirms the President's remarks on p. 189.

We may say, in conclusion, that out of the three-dozen firms mentioned by Mr. Cleland on p. 183 as using high-pressure systems to their entire satisfaction, thirty have adopted the Selas system—a fact which needs no comment.

Manchester, July 18, 1912. SELAS LIGHTING COMPANY, LTD.

Insurance Act (Part II.) and Gas Workers.

SIR,—Referring to my letter of the 12th inst., accompanying the copy of the decisions by the Umpire under the above-named Act, I am now informed that "it may be taken that the words 'wholly' or 'mainly' apply to the period of service for which the wages were then being paid." You might add this interpretation of these words to the end of the list of decisions [*ante*, p. 175], as it will assist to make clear the meaning of the words "wholly" or "mainly."

Glasgow, July 16, 1912. ALEX. WILSON.

The Ilkeston Gasholder Inquiry: A Correction.—Mr. W. Doig Gibb points out that in the report of this inquiry given in the "JOURNAL" last week, the sentence beginning on the 22nd line of his evidence (p. 208) should have read: "He had considered the strength of the tank in this case, and thought that *immediately above the bottom curb* it might have come down as low as 2·04."

REGISTER OF PATENTS.

Recovery of Sulphur from Gases.

TEED, F. L., of Mincing Lane, SULMAN, H. L., and PICARD, H. F. K., of London Wall, E.C.

No. 14,628; June 20, 1911.

According to this invention, the process for the recovery of sulphur from gases containing oxides of sulphur consists in mixing the sulphur gases with non-sulphurous reducing gases, or a mixture of non-sulphurous reducing and inert gases, and bringing them into contact with a solid "contact-agent," which will bring about a reaction between the gases. The reactions are:

(1) $SO_2 + 2CO = 2CO_2 + S.$
(2) $4H + SO_2 = 2H_2O + S.$

The invention more particularly consists in recovering sulphur from gases containing oxides of sulphur by mixing them with a proportion of a non-sulphurous reducing gas, or reducing substances in the state of vapour—such as carbon monoxide, hydrogen, hydrocarbons, &c., or mixtures containing these or any of them—such as producer gas, coal gas, water gas, natural hydrocarbon gases, &c., with or without inert gases, and with or without the addition of steam or water vapour. The quantity of such reducing gases must be proportioned to the amount of oxygen present in the sulphur gases, whether in the free state or combined with sulphur.

This mixture of non-sulphurous reducing gases with sulphur gases is brought into contact with a requisite amount of what is, in the specification, termed a solid "contact-agent" at a suitable temperature, which is maintained by any suitable means, such as by internal or external combustion or both, or electrically. The temperature of the "contact-agent" is in general from redness to orange heat—that is, from about 750° to 1000° C. This temperature may be exceeded without detriment to the reaction, though an excess of heat may give rise to less economical working. Again, the temperature will vary according to the amount of sulphurous gases to be reduced and the admixture of non-sulphurous reducing gas.

The contact-agent may be a substance like spongy platinum or platinized pumice, or the like, which has the power of bringing about reactions between gases without itself being affected; or it may be a substance which acts upon the mixture of reducing gases and gases containing sulphur in the oxidized condition with or without steam or water vapour, producing sulphur in the free state and being itself not permanently affected, or being converted into a substance or substances which also has or have this power.

Among the contact agents successfully used are magnesia, calcium sulphate, and the oxides of iron.

The following is given as an example of one method of carrying the invention into effect: Gases containing oxides of sulphur and water gas from a gas producer are led into a mixing-chamber in the proportion necessary to satisfy the desired chemical reaction. The mixture is then passed through a chequer-work of magnesia bricks maintained at a red heat either by the internal combustion of the gaseous mixture or otherwise; and thereafter the gases, now containing sulphur in the form of vapour, are passed into a condenser in which the sulphur is collected.

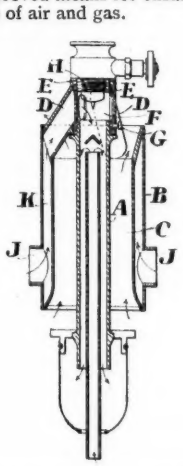
The contact-agent used is a substance which will ensure the reduction of the oxides of sulphur to sulphur by means of a reducing gas more effectively, and at a lower temperature, than would be possible in its absence. But it is also within the invention to use porous or other materials coated with, or containing, the contact-agent.

Inverted Incandescent Gas-Burners.

COLBRAN, J. B., of Chiswell Street, E.C.

No. 15,049; June 27, 1911.

This invention has special reference to the arrangement of tubes or openings through which the heated air or products of combustion pass respectively either to the mixing-chamber or to the atmosphere as the case may be; also to improved means for ensuring and regulating the admission and admixture of air and gas.



Colbran's Inverted Incandescent Gas-Burner.

The burner or bunsen tube A is surrounded by a hollow or double-walled cylindrical chamber B closed top and bottom, leaving a space C between. Within the bunsen tube is an air-tube, which extends downwardly into and through the mantle—being open at the bottom to admit of the passage of air to the mixing-chamber. From the top of the chamber B extend a series of upwardly and inwardly inclined tubes D, which lead into, and carry, a centrally disposed ring E, in which is adapted to be rotated the mixing-chamber F or the burner or bunsen tube, after the manner of the usual hit-and-miss valve, and controlled by a set-screw G. To the top of the mixing-chamber is the gas-inlet nozzle H; while the outer wall of the cylinder B, and at the lower end of it, is provided with perforations J, through which air is admitted to the space K between the walls of the cylinder—the amount of air passing being regulated by turning the tube A, and with it the chamber F.

Heating Kitchen Ranges by Gas.

LAMKIN, A. E, of Croydon.

No. 15,639; July 5, 1911.

This is an invention "whereby the boiler of an ordinary kitchen range may be heated by gas, so that, during the summer or upon other occasions when it is not desired to light a coal-fire in the stove, the oven may be heated and a supply of hot water for the bath or other purposes readily obtained.

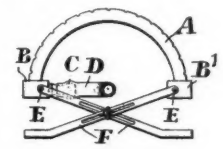


Fig. 1.

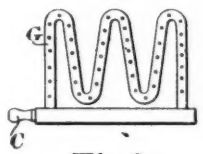
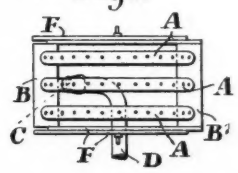


Fig. 2.



Lamkin's Gas-Heating Kitchen Ranges.

Fig. 1 is a side elevation and plan of one form of device embodying the invention. Fig. 2 is an elevation of a modified form.

The device shown in fig. 1 is designed for use with ranges provided with a saddle-back boiler, and comprises three curved tubes A, the ends of which are attached to the hollow chambers B B^1, one of which is provided with a nipple C, to which a flexible or other gas pipe D may be attached from a suitable source of supply. The perforated tubes A form burners, and a suitable orifice is provided so that a requisite quantity of air may be mixed with the gas. Pivoted at E to the ends of the chambers B B^1 are adjustable legs or supports F, so that the height of the burners from the bottom of the grate may be varied to suit different sized stoves. The device introduced into the grate (and its height adjusted by the legs F so that the burner-tubes are sufficiently close to the curved under-surface of the boiler) is connected by the nipple C and tube D with the gas supply, and upon igniting the air and gas mixture the water in the boiler will be heated.

In fig. 2, a device is shown suitable for ranges in which the boiler is at the side of the grate or for heating an oven by applying the flame to the outer surface of its side. The invention here consists in forming the burner, properly so called, by a tube G bent upon itself and having perforations at one side, so that the device, when stood upright in the grate with the perforations near the side of the boiler or oven, provides a large heating surface.

Audibly Indicating at a Distance the Extinguishing of a Lighted Lamp.

BETTANY, J. T., of Hanley, MEADOWS, W. A., and HEATH, C., of Stoke-on-Trent.

No. 18,622; Aug. 18, 1911.

This invention relates to means of audibly indicating in an automatic manner and in a predetermined place the extinguishing of a light or lights. It comprises a sealed flexible-walled chamber containing volatile material in proximity to the source of light, and an electric contact make-and-break device whereby heat from the light will produce such "flexion" as to break the contact and open the circuit, but when the light is out will re-make contact, so closing the circuit and sounding an alarm comprised therein—a switch being furthermore provided to cut off the actuating current when not required. The object of the invention (described as applied to a motor tail-lamp) is to provide an improved arrangement whereby the several parts can be readily secured at the side or rear of the source of light within a casing, leaving only two stationary terminals at the exterior to which to connect the leads of the electric circuit.

Manufacture of Gas and Coke.

ROLLASON, A., of Long Eaton.

No. 21,374; Sept. 28, 1911.

The patentee points out that some classes of coal (particularly those which become semi-fluid in the retort) require a very high temperature, and a long period of carbonizing, before all the gases are driven off. Experiments made show that the alumina disseminated in the coal determines the period of the evolution of the gases; the lime, the rate at which the gases are given off; and the proportion of basic substances, (lime, magnesia, &c.) to the silica and alumina, the temperature required in the retort, and the quality of coke produced. Alumina in the

coal prevents the cohesion of the carbon particles. Therefore coals high in alumina give off their gases readily at the commencement of the carbonizing period, and the coke produced is soft and dusty.

The present invention has for its object the reduction of the temperature in the retort and the period of carbonizing, also to improve the quality of the coke produced. This is effected by the addition of certain substances (mentioned), whereby the coal, when in the retort, is kept in an open state, and the ash contents rendered more fusible.

The patentee proposes to take a portion of ordinary coke, coke breeze, or coke dust, and add this to the coal which is low in alumina, and to be carbonized, "for the purpose of keeping the coal, when in the retort, in an open state, to allow the free evolution of the gases." A percentage of lime is also added to reduce the temperature required in the retort, and to increase the rate and volume of the gases evolved from the coal during carbonization. The addition of coke products, he says, will not materially increase the ash contents of the coke. Therefore the quantity added can be greater than in the case of lime, which increases the ash contents.

The quantity of coke products to be added may vary between 3 and 6 per cent., and in some cases where the coals are high in volatile matter even higher, the quantity of lime between ½ and 2 per cent., according to the nature of the coal to be carbonized—the coal varying considerably between a good Durham coal and common cannel. With ordinary Durham coal, approximately 3½ per cent. of coke products, and ¾ per cent. of lime, are added to the coal to be carbonized. The mixture of coal and coke products, and lime, is crushed below ¼-inch in diameter, and thoroughly mixed before charging the retort. The temperature required for carbonization can now be reduced to below 900° C., and the time of carbonizing reduced fully 20 per cent. The coke produced will be of lower specific gravity, and more suitable for domestic purposes, it is claimed.

Incandescent Gas-Lamps.

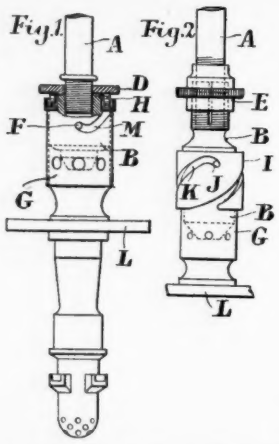
CARPENTER, C. C., of Old Kent Road, S.E.

No. 25,367; Nov. 14, 1911.

This invention has reference to inverted incandescent gas-lamps which are detachably secured to their nozzles or injectors, and which injectors are themselves screwed on to the gas-supply pipe. The object aimed at is "to render the fixing of the injector or nozzle to the supply pipe readily adjustable in a rotary direction, so that it may be turned and secured, if necessary, after the lamp has been fitted thereto."

To the supply pipe A is screwed a nozzle or injector B, with or without the surrounding cap shown in fig. 2. The nozzle or cap constitutes the attachment for the lamp, which is supported by the upper end of the bunsen-tube G. In fig. 1 the nozzle is locked on the thread of the pipe A by a back-nut D. In fig. 2 the socket of the nozzle which screws on to the pipe A is split and adapted to be compressed into the thread of the pipe by a sleeve-nut E.

For attaching the lamp to the nozzle, various devices may be employed



Carpenter's Adjustable Incandescent Gas-Burner.

—for instance, as shown in fig. 1 radial pins F project from the nozzle and engage with bayonet slots M in the bunsen tube G. H is a spring for keeping the pins in stationary engagement with the ends of the slots M. In fig. 2 a cap I is carried on the nozzle, and the top of the bunsen tube is introduced into the annular space between the cap and nozzle; pins J and slots K being provided to engage together and support the lamp L carried on the bunsen tube.

The position of the nozzle on the supply pipe may be readily adjusted in a rotary direction without reference to the bunsen tube attachment. Thus the lamp may be made to face any way, and may be fixed merely by manipulating the back-nut or locking-sleeve.

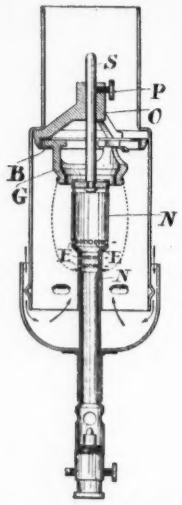
Incandescent Gas-Burners.

LENZ, O., of Berlin.

No. 4069; Feb. 17, 1912. Date claimed under International Convention, April 1, 1911.

This invention relates to an upright incandescent burner with a suspended mantle; its object being "to prevent injury to the mantle, which is very liable to occur in passing the gas-mixing tube of the burner through the mantle, which is provided with a lower opening for this purpose." Also, to provide for safety in the mounting of the mantle, the tube passing through it is "positively guided, so that it cannot strike against the edge of the opening in the mantle."

The mantle is fitted to the burner shown in the following manner: The extended portion N of the mixing-tube (with the pin S and the casting O clamped thereon) is removed and inverted, so that the part N is above and the part O below. The latter part is then seized and the screw P loosened, whereupon the part N and the pin S descend, and come so close to the part O that the mantle can readily be fitted. This prevents the possibility of any injury to the edge of the opening in the mantle by the extended portion N of the mixing-tube, as the latter is at a fair distance from this edge. By screwing together the part N and the opening in the mantle by means of the pin S, it can readily be ascertained whether the opening in the mantle is concentric with the part N. If this is not the case, the mantle-ring G is shifted laterally in the sheet-metal part B so as to centre it.



Lenz's Incandescent Gas-Burner.

When it has been ascertained that the opening in the mantle is concentric with the portion N of the mixing-tube, this part is passed through the opening until the first row of holes E comes level with the edge of the opening in the mantle, whereupon the part O is clamped by the screw P on the pin S, so as to maintain the parts in this position. This assemblage of parts is then again inverted, and the downwardly directed portion N of the mixing-tube is placed on the lower part of the mixing-tube. The part O can be raised or lowered on the pin S without inverting it in order to regulate the height of the mantle.

Money-Boxes for Prepayment Meters.

METROPOLITAN GAS METERS, LIMITED, and FORSTER, J. D., of Nottingham.

No. 6190; March 12, 1912.

The patentees point out that it has already been proposed in connection with gas-meter money-boxes to provide means whereby the coin drawer can be replaced in the casing in such a position that no money can be dropped into it from the prepayment mechanism, and so that its interior is exposed to view, "to render it evident that it is empty." Their present invention has for its object to make use of this principle in connection with a box having a lateral aperture, which coincides with an aperture in the side of the casing of the prepayment mechanism, and to which the money-box is attached by pins top and bottom, which enter eyes fixed to the casing—the box being locked thereto by a padlock, the staple of which fits through eyes on the casing of the prepayment mechanism and the coin receptacle respectively.

They provide upon the front of the box, and adjacent to the eye through which the padlock staple passes, a slotted lug large enough to pass over the fixed padlock eye or lug upon the casing of the prepayment mechanism; and upon the opposite side of the box is a projecting fin engaging with a grooved stop-piece fitted to the casing of the prepayment mechanism.

With this arrangement, when it is desired to close the money-box against use and to expose its interior to view, the box is removed from the prepayment mechanism, turned upside down, and thence through an angle of 90°, in which position it can be secured to the meter by causing the fin upon the money-box to engage with the grooved stop-piece upon the casing of the prepayment mechanism and the slotted lug simultaneously to engage with, or pass over, the fixed eye upon the casing, through which eye the padlock staple can then be passed so as to lock the inverted receptacle in place on the prepayment mechanism.

In practice it is advantageous, they say, that the coin-slot should also be closed against the introduction of coins when the money-box is secured in the inverted position. To this end they so dimension the money-box that when it is secured in the inverted position its front face projects beyond the front of the apparatus, and offers an obstruction to the plate which is usually pivoted in front of the coin-slot, so that the plate is prevented being turned down to expose the coin-slot.

Purchase Question at Silloth.—A special meeting of the Holme Cultram District Council was held last Wednesday, at Silloth, to consider the advisability of applying to the Local Government Board for a Provisional Order to enable the Council to purchase the undertaking of the North British Railway Company so far as it relates to the supply of gas in the district. The proceedings were of a formal nature, and a resolution that application for powers should be made was carried unanimously.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bill reported : Local Government Provisional Orders (Gas) Bill.

Bills read the third time and passed : Gas and Water Provisional Orders Bill, Gas Companies (Standard Burner) Bill, Shipley Urban District Council Bill, Staffordshire Potteries Water Bill.

The Keighley Corporation Bill has been referred to a Select Committee, consisting of the Duke of Wellington (Chairman), the Earl of Malmesbury, the Earl of Craven, Lord Inchcape. and Lord Canning ; to commence sitting to-day.

The Local Government Provisional Orders (No. 10) Bill [Salford Order] has been referred to a Select Committee, consisting of the Marquis of Bath (Chairman), the Earl of Rosse, Lord Penrhyn, Lord Southwark, and Lord Charnwood—sitting yesterday.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Lords Bills reported : South Suburban Gas Bill, Woking District Gas Bill.

Lords Bills read the third time and passed : Christchurch Gas Bill, Herne Bay Gas Bill, Houghton-le-Spring District Gas Bill, Sheffield Corporation Bill, Swanage Gas and Water Bill, Wakefield Gas Bill, York United Gas Bill.

Water Companies' Workmen and the Insurance Act.

On Monday last week, Mr. Peto asked the Secretary to the Treasury whether his attention had been called to the decisions of the Umpire under the National Insurance Act, the practical effect of which Mr. Bickerdike, the Registrar, had informed the Secretary of the Provincial Water Companies' Association, was that contributions are payable under Part II. of the Act in respect of water companies' workmen engaged wholly or mainly in constructing mains other than services the cost of which is usually chargeable to capital account, and are not payable in respect of workmen engaged in laying services or mains the cost of which is usually chargeable to revenue account ; and whether he could say what steps the employers should take to comply with the Umpire's decision, seeing that it is frequently impossible to decide at the time to what account particular work of this kind is chargeable, and that in respect of replacing mains with pipes of larger diameter only that portion of the cost is chargeable to capital account which represents the greater value of the larger main. The hon. member also inquired as to the effect of the payment of only an occasional weekly contribution under the provisions of the seventh schedule to the Act. Mr. Buxton, in reply, said he understood that the distinction drawn by the Umpire did not refer to the account to which the work performed by any particular workman was actually charged, but to the classes of work which, according to ordinary trade practice, were usually charged to capital or to revenue account respectively. He had no authority to interpret the Umpire's decisions, but it seemed to him that the distinction drawn was likely to be helpful in determining a number of borderland cases. If any cases of real doubt remained, the Board of Trade would be glad to give their assistance in clearing up the difficulty if the company affected will communicate with them.

SOUTH SUBURBAN GAS BILL.

West Kent Differential Price—Calorific Value Tests.

The Bill, promoted by the South Suburban Gas Company, which has already passed through the House of Lords [see "JOURNAL," Vol. CXVIII., p. 44], was sent forward for third reading by the Unopposed Bills Committee of the House of Commons last Thursday.

Mr. C. E. C. BROWNE (Messrs. Dyson and Co., Parliamentary Agents) explained that the object of the Bill was to amalgamate the South Suburban, Bromley and Crays, and West Kent Gas Companies. Since the Bill passed the House of Lords, a petition had been presented against it by the London County Council, in which it was suggested that the time was now ripe for the substitution of calorific value as the test for gas instead of illuminating power, due to the general adoption of the incandescent burner. This suggestion had led to the Company entering into negotiations with the local authorities within the limits of supply, with the result that some of them had agreed to the insertion of a clause in the Bill substituting, so far as their district was concerned, the calorific value test. Other local authorities had not yet agreed, and one of them had refused absolutely to agree. In the case of those who had not yet agreed, however, there had been inserted in the Bill, with the assent of the Board of Trade, a clause empowering the Board to extend to any other districts whose authorities might subsequently agree the provisions already applied in regard to testing to those authorities who had already agreed. The effect of this would be that the test for illuminating power would be a voluntary one—*i.e.*, the gas examiners would be empowered to continue testing for illuminating power, but there would be no penalty in case there should be any deficiency in illuminating power. Everything would depend on the calorific or heating value of the gas. The Company had adopted the British thermal unit as the basis of measurement, so as to have the two sides of the scale on the same national measurement. Adopting the calorie instead of the B.Th.U. would have resulted in there being one national standard on one side of the scale, and another national standard on the other side.

The CHAIRMAN said he thought it would be very desirable for the gas profession to definitely agree what was to be the standard, in order not to have two of them.

Mr. BROWNE said that the adoption of the British thermal unit would also enable the test to be described without the complication of long strings of decimal figures. The calorie was a Continental standard ; and he did not think it was recognized as a legal standard here at all. Continuing, he said there had been two other amendments in the Bill since it left the House of Lords—one at the instance of Mr. James Rowlands, M.P., providing that instead of the differential price in the West Kent district being in perpetuity, it should disappear at the rate of 1d. per year, after which period the price in the whole area of the Company would be the same. The clause was as follows, and was an addition to clause 35 :—

> In respect of each period of twelve months, commencing on the first day of July, 1925, and on each subsequent first day of July, the amount of the difference between the price to be charged by the South Suburban Company as aforesaid in the West Kent district and the price for the time being charged in the South Suburban district shall be reduced by 1d. per 1000 cubic feet until such difference shall be extinguished ; and thereafter the price to be charged by the South Suburban Company throughout the West Kent district shall be, and continue, the same as the price for the time being charged by the South Suburban Company in the South Suburban district.

[This amendment was referred to in the "JOURNAL" at the time of the second reading, together with one, made at the instance of Mr. Handel Booth, providing that notice of discontinuance of supply may be given orally, as well as in writing.]

Mr. *Charles Hunt*, the Chairman of the South Suburban Company, having proved the preamble of the Bill, it was ordered to be reported for third reading, as already mentioned.

In view of the importance of the question of calorific value and testing, we give below the clauses in the Bill which have been added relating to this matter. At present, these will apply to the Metropolitan Boroughs of Lewisham, Camberwell, and Lambeth, and the County Borough of Croydon, the Borough of Bromley, and the Urban Districts of Bexley, Erith, and Penge.

Calorific Value and Testing Clauses.

SOUTH SUBURBAN COMPANY TO PROVIDE APPARATUS FOR TESTING CALORIFIC VALUE.

Within six months from the date of transfer, the South Suburban Company shall provide, at each of the prescribed testing-places within the specified districts, apparatus for testing the calorific value of the gas supplied by them at such testing-place, similar to the apparatus for the time being prescribed by the Metropolitan Gas Referees for testing the calorific value of the gas supplied by the Companies referred to in "The London Gas Act, 1905." Provided that where any apparatus for testing the calorific value of the gas supplied by the South Suburban Company shall have been provided at any such testing-place by any local authority under the provisions of section 5 (as to testing for calorific power, sulphur, impurities, and illuminating power with flat-flame and incandescent burners) of "The South Suburban Gas Act, 1906," and the apparatus so provided is similar to the apparatus for the time being prescribed by the Metropolitan Gas Referees, as aforesaid, the South Suburban Company shall not be required (except for any necessary renewal or replacement) to provide at that testing-place any apparatus for such testing ; but the apparatus so provided shall be deemed, for the purposes of this Act, to have been provided by the South Suburban Company.

SUBSTITUTING STANDARD CALORIFIC VALUE FOR PRESCRIBED ILLUMINATING POWER.

As from the date on which the South Suburban Company shall have completed the provision of the apparatus referred to in the section of this Act of which the marginal note is "South Suburban Company to Provide Apparatus for Testing Calorific Value" at all the prescribed testing-places within the specified districts (except as provided by the said section) :

(*a*) Every enactment in force immediately before that date, whereby or by virtue whereof the gas supplied by the South Suburban Company is required to be of a prescribed illuminating power shall, in relation to the specified districts, cease to apply with respect to such gas ;

(*b*) The South Suburban Company shall cease to be under any liability or obligation to provide or maintain at any testing-place within the specified districts any apparatus for testing the illuminating power of such gas, but shall be at liberty to remove from all or any of the said testing-places any such apparatus which they have provided thereat ;

(*c*) The South Suburban Company shall not be liable to any penalty in respect of any deficiency in the illuminating power of the gas supplied by the South Suburban Company within the specified districts ;

(*d*) The gas supplied by the South Suburban Company within the specified districts shall, when tested in the mode and under the conditions for the time being prescribed by the Metropolitan Gas Referees for testing the calorific value of gas, be of a standard calorific value of 540 British thermal units gross per cubic foot (the expression "British thermal units" being used in this part of this Act as meaning British thermal units gross per cubic foot). Provided that the South Suburban Company shall not be liable to any penalty or proceedings for, or in respect of, deficient calorific value of the gas so supplied by them, except in accordance with the provisions hereinafter contained ;

(*e*) The section of this Act of which the marginal note is "No Penalty in Case of Unavoidable Cause" shall, in relation to the specified districts, be read and have effect as if the words "defect of illuminating power" were omitted therefrom ;

f) The provisions contained in the sections of this Act of which

the marginal notes are respectively "Provisions as to Testing for Calorific Value" and "Penalties for Deficient Calorific Value" shall have effect;

(*g*) Section xl. (Quality of Gas to be Supplied by Company), section xli. (Company to Erect a Meter to Test Purity of their Gas), section xlii. (Power of Justices on Requisition to Authorize Testing of Gas), and section xliii. (Cost of Experiment) of "The Crystal Palace District Gas Company's Act, 1858," and sub-sections (1), (a), and (2) of section 3 (Illuminating Power and Burner for Testing Gas) of "The South Suburban Gas Act, 1906," shall be, and the same are hereby, repealed so far as regards the specified districts; and

(*h*) Nothing in this Act shall alter, vary, or affect the provisions of section 5 of "The South Suburban Gas Act, 1906," and there shall be deemed to be added to the testings which, under the provisions of that section, may be made at any testing-place within the specified districts a testing for the purpose of ascertaining the illuminating power of the gas supplied by the South Suburban Company at such testing-place by means of the burner prescribed by section 3 of the Act of 1906, and used in the manner therein prescribed.

PROVISIONS AS TO TESTING FOR CALORIFIC VALUE.

The following provisions shall apply with respect to the testing for calorific value of the gas supplied by the South Suburban Company within the specified districts:—

(1) The gas examiner of the controlling authority may at any testing-place at which that authority is authorized to test the gas supplied by the South Suburban Company, test at any hour of the day or night the calorific value of such gas at that testing-place;

(2) The South Suburban Company may, if they think fit, on each occasion of the testing of gas under the provisions of this section, be represented by some officer (who shall not interfere in the testing), and the gas examiner shall inform the South Suburban Company on what day and at what time it is proposed to make any such testing, so as to give reasonably sufficient notice to enable them to be represented as aforesaid;

(3) Not more than one testing for calorific value shall be made at any testing-place on any one day (reckoned from midnight to midnight), except that, in the event of the calorific value being, on any testing, ascertained to be below 447 British thermal units, a second testing shall be made on the same day, but at an interval of not less than one-hour from the time of making the first testing at that testing-place, and the average of the two testings shall be deemed to be the calorific value of the gas at such testing place on that day;

(4) If on any one day the gas supplied by the South Suburban Company at any such testing-place is of less calorific value than 475 British thermal units to an extent not exceeding 28 British thermal units, the gas examiner shall make at such testing-place a testing of the calorific value of such gas on each of the two following days, and the average of the three testings so made shall be deemed to represent the calorific value of the gas on such one day at such testing-place;

(5) The gas examiner shall forthwith give notice to the South Suburban Company at their office of any defect of calorific value ascertained by him on any testing made under this section;

(6) Section 33 of "The Gas-Works Clauses Act, 1871," in its application to the South Suburban Company in relation to the specified districts, shall be construed as if calorific value were therein referred to in lieu of illuminating power.

PENALTIES FOR DEFICIENT CALORIFIC VALUE.

Where the calorific value on any day of the gas supplied by the South Suburban Company within the specified districts is less than 475 B.Th.U., they shall be liable to the following penalties in respect of such deficiency—that is to say:—

Where the deficiency does not exceed 14 B.Th.U., £2;
Where the deficiency exceeds 14 B.Th.U., but does not amount to 28 B.Th.U, a sum not exceeding £5;
For each complete 28 B.Th.U. of defective value, a sum not exceeding £10.

Provided that the South Suburban Company shall not be liable to any penalty in any case in respect to which it is proved before the Justices that the defect of calorific value was occasioned by unavoidable cause or accident.

POWER TO BOARD OF TRADE TO EXTEND THIS PART OF ACT TO OTHER DISTRICTS.

The Board of Trade may at any time, on the joint application in writing of the South Suburban Company and the local authority for any district within the limits of supply of the South Suburban Company (not being one of the specified districts), by Order under the hand of the Secretary or any Assistant-Secretary of that Board, direct that the provisions of this part of this Act shall (subject to the modifications hereinafter referred to) apply and have effect within the district of that local authority, and as from the date on which any such Order shall come into force, the said provisions shall apply and have effect accordingly as if the district to which such Order relates had been one of the specified districts, and as if the local authority for that district were in relation thereto the controlling authority for the purposes of this part of this Act.

Provided that for the purposes of any Order made under the provisions of this section, the sections of this Act of which the marginal notes are respectively "South Suburban Company to Provide Apparatus for Testing Calorific Value" and "Substituting Standard Calorific Value for Prescribed Illuminating Power" shall be construed as if (*a*) the date on which such Order shall come into force had been substituted in the first-mentioned section for the date of transfer, and (*b*) the date on which the South Suburban Company shall have completed the provision of the apparatus referred to in the said first-mentioned section at the prescribed testing-place or testing-places within the district to which such Order relates had been substituted for the date referred to in the secondly mentioned section.

Provided also that this section shall not apply to the Urban District of Beckenham.

WOKING AND DISTRICT GAS BILL.

HOUSE OF COMMONS COMMITTEE—Friday, July 19.

(*Before Mr.* HUGH LAW, *Chairman, Mr.* FITZHERBERT WRIGHT, *Sir* PHILIP SASSOON, *and Sir* JOHN BETHELL.)

This Bill has already passed the House of Lords [see "JOURNAL," Vol. CXVIII., p. 453], and was now unopposed on preamble. The only opposition was by the London and South Western Railway Company, in respect of protective clauses.

Mr. VESEY KNOX, K.C., and Mr. A. M. PADDON appeared for the Gas Company; and Mr. C. C. HUTCHINSON, K.C., and Mr. SZLUMPER represented the London and South Western Railway Company.

Mr. VESEY KNOX stated that the Woking and District Gas Company was a limited liability Company, who had been carrying on business for 21 years. The Bill proposed to dissolve the limited Company and incorporate a statutory Company, to authorize additional capital and borrowing powers, to apply the sliding-scale, and to slightly extend the area of supply. There were a number of proposals in the Bill which were contested in the other House. The local authorities got some things and did not get others; but he presumed they were now content, as they did not appear. The London and South Western Railway Company were the only opponents, and were asking for additional protection to that given in the Bill. Already there was a long clause in the Bill giving the Railway Company greater protection than they would have under the general law; this clause having been inserted in the Gas Company's Order of 1891 by agreement. As a matter of fact, under the new conditions of the Gas Company, he would have been entitled to ask that the Railway Company be put back under the provisions of the general law; but he had no desire to go behind the agreement made in 1891, and was content to transfer the clause in the 1891 Order to the present Bill, and, further, to extend its operations to the whole of the district, including the additional area. There had never been any difficulty in working under the existing clause; but the Railway Company asked for something even more than this extended clause gave. The clause in the Bill read:

For the protection of the London and South Western Railway Company (in this section referred to as the "South Western Company"), the following provisions shall (unless otherwise agreed between the Company and the South Western Company) apply and have effect:—

(*a*) In laying down, repairing, or removing any mains or pipes, or executing any other works in the exercise of the powers contained in this Act upon, across, over, under, or in any way affecting the South Western Railway, or any bridge over or under such railway, or any approaches to any such bridge within the South Western Company's boundary, the same shall be laid down, repaired, removed, or executed under the superintendence and to the reasonable satisfaction of the Chief Engineer of the South Western Company, and according to such plans, sections, and specifications, and except in case of urgent necessity at such times as shall be previously submitted to, and as shall be reasonably approved in writing by, him, and any such works shall be executed by, and at the expense in all things of, the Company, and so as not to cause any injury to the said railway or to any such bridge, or the approaches thereto, within the South Western Company's boundary, and the Company shall within such boundary so execute any works as, having regard to the existing level of the roadway, shall interfere with or impede as little as possible any improvement or widening of such railway or bridge, or the introduction of side openings to such bridge. Provided that if the said engineer does not express his approval or disapproval of the said plans, sections, and specifications within fourteen days after the same have been submitted to him, he shall be deemed to have approved thereof, and if the said engineer refuse or neglect to superintend any operation the Company may execute the work without his superintendence;

(*b*) If any injury or damage to, or any interruption of, the South Western Company's traffic shall be in any way occasioned by the Company, or by their contractors, agents, or workmen, the Company shall forthwith make full compensation to the South Western Company in respect thereof;

(*c*) All mains, pipes, and other works of the Company upon, across, over, under, or in any way affecting the South Western Railway, or any bridge over or under the same, or the approaches thereto, within the South Western Company's boundary, shall be at all times maintained in good repair by the Company, and in default of their being so maintained, the South Western Company may from time to time, by notice in writing signed by their said engineer, and delivered at the principal office for the time being of the Company, require the Company to forthwith put into good repair any such main, pipe, or other work as aforesaid as may be in want of repair, and if the Company, for seven days after the receipt of such notice, refuse or neglect to proceed with the repair of the same, and do not dispute the necessity thereof, the South Western Company may, without any further notice to the Company, repair the same, and all expenses reasonably incurred by them in or about such repair shall be repaid to them by the Company. Provided that in case of accidents happening, or immediate danger being apprehended to the South Western Railway, or any bridge over or under such railway, or the approaches thereto, by reason of any such main, pipe, or other work as aforesaid being in want of repairs, the South Western Company may, without giving such notice as aforesaid, make such repairs as may be necessary, and the expenses of the same shall be repaid as hereinbefore provided;

(*d*) The Company shall bear, and on demand pay to the South Western Company, all reasonable costs of the superinten-

dence by them of the construction of the works and repairs thereof, and all reasonable costs of watching, lighting, and protection of the South Western Railway with reference to and during such construction and repairs, so far as such costs may be, in case of difference, determined by the arbitrator to have been necessary:

(*e*) Any difference which may arise between the South Western Company and the Company touching any of the matters referred to in this section shall be decided by a single arbitrator, to be appointed on the application of either party by the President of the Institution of Civil Engineers, and subject, as aforesaid, the provisions of the Arbitration Act, 1889, shall apply to any such references.

Continuing, Counsel said that among the additions to the clause which the Railway Company asked were that if there was not sufficient space on any bridge to lay mains between the road surface and the structure of the bridge, the Gas Company should lay their mains at their own expense, independently of the bridge. They also wished to increase the present provisions as to notice for carrying out any works on the part of the Gas Company, and also the period during which the Railway Company should approve of plans of such works. Another important proposal was that where the Railway Company wished to carry out any improvements to bridges, &c., the Gas Company's mains were to be altered at the expense of the Gas Company. Again, they wished to have the right to approve of the laying of mains in positions "adjoining" the Railway Company's property, which imposed a distinct hardship, because it might so happen that a main running down a public road might "adjoin" the Railway Company's property, and it seemed most unfair to him that the Gas Company should not only have to work under the supervision of the road authority, but also of the Railway Company. He was willing to meet the Company on the question of notice and one or two smaller matters; but he asked the Committee to adopt the clause already in the Bill as the basis, and refuse to insert the extra provisions which he had outlined.

Mr. *A. F. Phillips* (the Consulting Engineer to the Woking Company) was called to prove the preamble of the Bill.

Mr. HUTCHINSON said the proposals which he was placing before the Committee had been included in a large number of cases; and with the exception of the addition relating to laying mains independently of a bridge where there was not sufficient space on the bridge, the whole of his proposals had been granted in the Eastbourne Act of 1910. In the first place, he wanted it made clear that the protection at present afforded by the Bill was applicable to the whole area, and not only to the old area.

Mr. VESEY KNOX said he was quite willing to make this clear.

Mr. HUTCHINSON, continuing, said that clauses differing somewhat slightly in words, but embodying a similar principle in regard to the points mentioned by Mr. Vesey Knox, had been included in no less than nine Acts and Orders between 1901 and 1911, and in this session were included in the Bordon and Christchurch Acts, and the Tavistock Gas Bill. In the Eastbourne case, the protection had been given to the London, Brighton and South Coast Railway, and, if anything, was even more stringent than what he was asking for. He regarded the proposed proviso to sub-section (*a*) of the existing clause, relating to laying mains independently of a bridge where there was not room, as most important. He further asked for an absolute prohibition on the Gas Company from doing anything which would obstruct or interrupt traffic on the railway, because under the general law the Gas Company could interfere with and obstruct the Railway Company's operations, and claim to be immune from damages on the ground that they were working under statutory powers.

Mr. VESEY KNOX pointed out that under the clause in the Bill the Gas Company were liable to damage for any interruption of the Railway Company's traffic "occasioned by the Company, or by their contractors, agents, or workmen;" but in order to bind the Company even more, he would be willing to insert the words "directly or indirectly."

Mr. HUTCHINSON next referred to protection for the Railway Company in respect of a burst main; so that no matter from what cause this happened, the Gas Company should be liable. As the law stood at present, the Gas Company could plead statutory powers and so go scot free.

Mr. VESEY KNOX objected to the wide terms of this suggested power, because it might happen that a railway company's own van might be the cause of a burst main over a railway, yet the gas company were to pay the railway company for damage caused by the railway company's own act.

Mr. HUTCHINSON said similar protection had been included in the Leigh Corporation Act of 1903. Continuing, he asked for a month's notice in writing of intention to carry out works, but he thought he would be content with 21 or 28 days. He next wanted a provision that the pipes should be maintained in good repair, and that the Railway Company could require repairs of the mains to be carried out where they affected their property, and, in default of repair by the Gas Company, to have them carried out at the Gas Company's expense. His clause further provided that although the Railway Company were to superintend any works affecting their undertaking, this supervision was not to relieve the Gas Company from any liability in connection with the works. So far as he had gone, his proposals were extensions of clauses existing in the Bill. He now, however, wished to propose a new sub-section which was not in the Bill at all, which was to the effect that if at any time it was found necessary for the Railway Company to carry out any alterations, renewals, or repairs to the railway works, the Gas Company should, at their own expense, after reasonable notice and to the satisfaction of the Railway Company, carry out the necessary alterations to any pipes and mains which might be affected by the Railway Company's works. This clause was in the Eastbourne Act, although very strongly contested by the Eastbourne Gas Company. He asked the Committee to realize the importance of his proposals, because in the present Bill the 1891 Order of the Woking Gas Company was repealed, and it was doubtful whether the clause in the Bill really applied to the old area. The Railway Company had in the present area of the Woking Gas Company three stations and fourteen crossings by means of bridges, and in the extended area, one station and ten crossings, in addition to four roads running over the railway. There were also a good number of footpaths crossing the roadway.

Mr. *J. W. Jacomb Hood* (Chief Engineer to the London and South Western Railway Company), Mr. *C. L. Morgan* (Chief Engineer to the London, Brighton, and South Coast Railway Company), and Mr. *Arthur Paine* (railway and general engineer), gave evidence in support of the proposals of the Railway Company; their argument being that, in view of the enormous responsibility of the Railway Company to the public, every possible protection should be afforded to them. They could not, however, point to any insurmountable difficulty in the past under the existing clause.

Mr. VESEY KNOX, in addressing the Committee against the insertion of the clause, emphasized the point that the Gas Company were not coming to Parliament for the first time in respect of a new undertaking, and pointed out that the Railway Company were seeking to get better protection than they agreed to in 1891. He strongly objected to the proposal to make the Gas Company pay for the removal of works in connection with alterations and improvements to the railway, and also to the proposal to carry the pipes outside bridges. On the other minor points, he thought it was possible to meet the Railway Company in the directions he had already indicated.

The Committee, after consideration, decided that the clause in the Bill must stand as the basis. They ordered the addition of the following words to sub-section (*a*): "Provided also that where there is not sufficient space on any bridge to lay any mains or pipes between the road surface and the structure of any such bridge, the South Western Company may require such mains or pipes to be carried below, outside, or independently of, the structure of any such bridge, and shall afford reasonable facilities for the purpose." Then, in addition to this, in sub-section (*b*) the words "directly or indirectly" would be inserted after the word "occasioned." The period within which the Railway Company must approve of plans was to be 28 days, with a further notice of one month before which the works could be commenced, except in cases of emergency. Finally, in sub-section (*a*), after the words "powers contained in this Act," the words "or in any Act incorporated therewith" would be inserted, in order to make it clear that the clause applied to the whole of the Gas Company's undertaking. The remainder of the proposals put forward by the Railway Company were rejected.

HOLMFIRTH ELECTRIC LIGHTING ORDER.

HOUSE OF COMMONS COMMITTEE.—Monday, July 15.

(*Before Sir* FRANCIS LOWE, *Chairman, Mr.* RICHARD LAMBERT, *Mr.* THOMAS RICHARDSON, *and Mr.* HERBERT CRAIG.)

Further evidence was heard to-day in connection with the Holmfirth Electric Lighting Order, the opening proceedings in which were given in the "JOURNAL" last week (p. 204).

Mr. J. D. FITZGERALD, K.C., and Mr. TYLDESLEY JONES appeared for the Urban District Council; and Mr. A. M. PADDON represented the Holmfirth Gas Company.

Mr. *Thomas Brooke* was further cross-examined by Mr. PADDON, and said that at present thirteen members of the Council were in favour of electric lighting and eight against; the latter including the Chairman. This gentleman, however, was associated with the Gas Company; and although he did not suggest that the Chairman of the Council did not give an honest vote, yet he could not help thinking that his mind had been poisoned in consequence of his relationship with the Company. Further questions were put to witness to show that there were many urgent matters relating to the local government of the district—such as improvements in the water supply and sewerage—which necessitated the attention of the Council much more than electric light.

Mr. *W. Pollard*, the Secretary of the Holmfirth Tradesmen's Association, consisting of 51 members, said that 44 of these were in favour of the electric light. There had been considerable dissatisfaction with the gas supply.

In cross-examination, witness said he did not know that the gas in Holmfirth was five candles higher than that in London.

Mr. PADDON, in reply to a suggestion that the street lighting was bad, said that this was solely due to the Council's neglect of the lamps, which they themselves had to maintain and keep in order.

In re-examination, Mr. FITZGERALD made the point that the Company were responsible for the quality of the gas, and that under the conditions existing in Holmfirth there were no means for the Council to test it.

Mr. *Harry Marsden*, the Engineer and Manager of the Honley Municipal Electric Sub-Station and Gas-Works, said that Honley was a very similar district to Holmfirth. The cost of the electric light per unit in his station was at present a little over 1¼d., and there was a profit on the undertaking. As in Holmfirth it was proposed to take current in bulk at a maximum price of 1d., he thought the prospects of success were very considerable. He had prepared estimates of the proposed scheme, and had arrived at a total of £5726. Taking 260 consumers as the basis of his calculations, he anticipated a profit at the end of the second year of £143. His estimates were based upon a revenue of 6d. per unit.

In cross-examination, witness would not agree that Honley was a richer district than Holmfirth. Counsel put questions to show that the Honley Electricity Works had been in existence for eight years, and were only just making ends meet; and even this result was due to its association with the gas-works, for only £10 was charged as the proportion of the Gas Manager's salary in respect of his management of the electricity undertaking. Thus it was evident the gas undertaking was bearing the greater part of the administrative charges.

Mr. *A. B. Mountain*, Chief Electrical Engineer to the Huddersfield Corporation, and who was also Consulting Engineer to the Honley undertaking, supported Mr. Marsden's estimates.

This closed the case for the promoters.

Mr. *H. W. Couzens*, a Consulting Electrical Engineer, was then called on behalf of the Gas Company, and expressed the opinion that there would undoubtedly be a loss upon the scheme. It was a very

poor district; and he did not know of any similar one where there was a profitable electrical undertaking. He disagreed with the promoters in suggesting the use of overhead wires for distribution throughout the area, and expressed the opinion that there would have to be a fair amount of underground mains, which would increase the cost very considerably. His estimate of the total capital expenditure, if the scheme was carried out according to his ideas, was £9962, which included a proportion of underground cables. Even adopting overhead wires for all the distribution, as was suggested, he still arrived at a figure of £8300, compared with the promoters' £5726. Apparently the promoters expected to carry on the undertaking with practically no loss in transmission, whereas the average throughout the country with this class of installation was about 12½ per cent. He also disagreed with the allowance which had been made for labour, and thought that a linesman and his mate would be necessary, in addition to the ordinary staff, for keeping the overhead distribution network in repair. He estimated a loss at the end of ten years of about £480; and this figure was characteristic of what was going on all over the country. He was surprised to note that the revenue had been based upon 6d. per unit, which was the maximum in the Bill. The maximum price should be increased to 8d.

In answer to Mr. FITZGERALD, witness maintained that the Honley works were only made to pay in consequence of their association with the gas-works. Without this, they would not be self-supporting.

Mr. *A. E. Buckley*, the Engineer and Manager of the Holmfirth Gas Company, said that the Company had been in existence since 1839, since when they had not been to Parliament. The average illuminating power during the past ten years was 17¼ candles, tested by the jet photometer, which was an absolutely accurate test for pure coal gas, such as was supplied. If tested by the standard burner now adopted by most undertakings, the illuminating power would be 20 candles. Consequently, the Holmfirth consumers were not injured in consequence of the Company not working under modern gas legislation. Again, the maximum pressure at the works was 25-10ths, as against 10-10ths required by Parliament. Only two complaints had been raised as to the quality of the gas—one from the Council, and the other from the Tradesmen's Association; but neither of them was justified. From private consumers there had been practically no complaints. The public lamps were in a very neglected condition; and although frequent application had been made to the Local Authority by the Company to take into their hands the complete control of the public lighting, these offers had been mostly ignored. The average dividend paid by the Company for the 72 years of their existence was £5 8s. per cent. The money spent upon works, &c., during this period had not been drawn from the consumers, inasmuch as it had been provided by money which could have been distributed as dividends. The Company never refused to supply in any part of the district where a consumer would guarantee 10 per cent. on the cost of the main. As a matter of fact, they were entitled to ask for 20 per cent. under their Act. Experiments had been carried out with automatic lighting for the streets; but they had been unsuccessful, for the reason that the Council would not allow the experiments to be completed. The last offer to the Council was to instal 200 lamps, with a total of 92,000-candle power, against the present 72,500-candle power, at an annual charge of £392, and at the end of ten years the lamps could be taken over by the Council if they thought fit.

In cross-examination, witness said that this offer was made at the time of the Board of Trade inquiry. Counsel remarked that under the electric light scheme they were going to have 350 lamps at a total cost of £379, which seemed a rather better bargain. The Company, continued witness, had not been to Parliament because there was no necessity to do so. He agreed that the Local Authority had no power to test the gas; but the automatic recording charts for the last ten years showed that the pressure and illuminating power had never been below what they should have been. So far as the private consumer was concerned, it would have been against the Company's own interests not to have kept up to a proper standard. The price charged for gas in the district was 3s. 1d. per 1000 cubic feet, and nobody could deny that this was reasonable.

Mr. A. M. PADDON, in addressing the Committee, said that, even if the Company opposed purely on the point of competition, he would have a distinct right to consideration at the hands of the Committee; but they were not opposing on the mere dog-in-the-manger ground of competition. They did not wish to stand between the Council and the electric supply if it could be carried on economically; but it was because the Gas Company feared they would be faced with competition of an unfair kind that they asked the Committee to hear them. The district was a very poor one. There were 2300 houses; and only 317 had a rateable value of over £20. This included mills, which the Council did not propose to supply. Even if the Order were refused, it would not free the Gas Company from the fear of competition, because a company might very well apply for electric lighting powers in a district; but the Gas Company did not object to clean-cut, fair, commercial competition. Under municipal control, however, if there was a loss, it fell with peculiar hardship first on the Gas Company, and secondly on those on whom the Company depended for their business, because the user of gas was paying through the rates for maintaining the electrical undertaking. There were three courses which he would place before the Committee. First, the Committee might decide not to let the Order proceed. The second course was to insert provisions in the Order that it must be transferred to a Company, giving the Council the right to acquire it later, should they desire to do so. This had already actually been done in the Abingdon Electric Order, which was included in the Confirmation Bill then before the Committee. The third course was that the Committee should change the revisional period of five years in the "Winchester" clause in the Order to three years. He further drew attention to the fact that in its present form the clause was absolutely nugatory, because the maximum price was 6d. per unit, and all calculations of revenue were upon a price of 6d. Thus there was no margin for adjustment; and he asked the Committee to insert a maximum of 8d.

The CHAIRMAN did not call upon Mr. Fitzgerald to reply, and, after conferring with the other members of the Committee, announced that they had decided to find the preamble of the Order proved as it stood.

PARISH COUNCILS AND PROVISIONAL ORDER APPLICATIONS.

Consents Dispensed with by Board of Trade.

In accordance with the provisions of the Gas and Water Works Facilities Act, 1870, the Board of Trade have presented to Parliament reports setting forth their reasons for dispensing with the consents of two Parish Councils and certain parish meetings in the cases of the following Gas Provisional Orders.

Hatfield (Yorks.) Gas Order.

The application for this Order was made by the Hatfield (Yorks.) Gaslight and Coke Company, Limited, who sought power to maintain and continue their existing works, and to manufacture and supply gas within the parishes or townships of Hatfield and Stainforth, in the West Riding of the county of York. Objections to the application were lodged by the Stainforth Parish Council, the Hatfield Main Colliery Company, Limited, the West Riding County Council, the Great Central Railway Company, and the Sheffield and South Yorkshire Navigation. But the promoters agreed to insert clauses in the Order for the protection of the three last-named objectors; and their opposition was accordingly withdrawn.

Having failed to obtain the consent of the Stainforth Parish Council, the promoters requested the Board of Trade to dispense with the consent; and the Board accordingly held an inquiry into the matter.

It appeared from the evidence given at the inquiry that the Company was formed in 1862, and that they are supplying gas without statutory powers in the village of Hatfield and to the Stainforth Railway Station. The Stainforth Parish Council had refused their consent to the application, on the ground that cheaper gas than can be supplied by the promoters may be obtained in the future from the Hatfield Main Colliery Company, who propose to open a mine in the parish. This Company have acquired in the parish land on which they intend to build houses for their workmen; and it was stated that gas will be supplied to these houses by the Company, who would not require a supply from the promoters. It was stated, however, that the colliery would not be working for at least three years.

In view of the fact that the promoters have been supplying gas in the vicinity for a considerable period, and that the prospect of a supply to the parish of Stainforth by the Colliery Company is somewhat remote, the Board decided to dispense with the consent of the Parish Council, and to grant the Order, subject to certain modifications which appeared to be desirable.

Welwyn, Knebworth, and District Order.

The application for this Order was made by the Welwyn, Knebworth, and District Gas Company, Limited, who sought power to maintain and continue their existing gas-works, to construct and maintain further works, and to manufacture and supply gas within the parishes of Aston, Datchworth, Watton-at-Stone, Tewin, Welwyn, Digswell, Ayot St. Peter, Ayot St. Lawrence, Codicote, Knebworth, and Shephall, in the county of Hertford. Objections to the application were lodged by the Digswell parish meeting, the Great Northern Railway Company, and the Hitchin Rural District Council; but those from the two last-named bodies were subsequently withdrawn.

Having failed to obtain the consent of the Aston Parish Council and of the parish meetings held at Digswell, Shephall, and Ayot St. Lawrence, the promoters requested the Board to dispense with these consents. An inquiry in the matter was accordingly held at the offices of the Board of Trade; but the Digswell parish meeting was the only one of the dissenting bodies who sent representatives.

It appeared at the inquiry that the sole remaining objection to the Order was by owners and occupiers of property in the neighbourhood of the site on which the promoters propose to erect their new works; and they opposed on the ground that the works would injuriously affect the amenities of the district. There was no wish on the part of the opposition to prevent a supply of gas being afforded to the district; and another site was suggested on which the works might be erected.

In these circumstances, the Board directed one of their officers to make an inspection of the two sites. He reported that works erected on the site proposed by the promoters would be scarcely visible from the property of the objectors, owing to intervening objects; and that trees planted round the site to form a screen would further cut off any view of the works. The site suggested by the objectors was at a considerable distance from any buildings, and, being at a somewhat higher level than the railway, as well as in an isolated place, would prove expensive to use; thus increasing the cost of manufacturing gas.

After considering this report, the Board decided that the Order should be granted, subject to the insertion of a provision requiring the promoters to plant trees on three sides of the site, so as to provide, so far as practicable, an efficient screen round the works on these sides. The Board accordingly made the Order.

TIPPERARY GAS ORDER.

This Order, which has for its object the incorporation of the Tipperary Gas Company, came before a Committee of the House of Lords, presided over by VISCOUNT FALKLAND, on Thursday last.

Mr. C. C. HUTCHINSON, K.C., and Mr. SZLUMPER appeared for the promoters; while Mr. VESEY KNOX, K.C., and Mr. JEEVES represented the opposition—the Tipperary Urban District Council.

Mr. HUTCHINSON said he thought it would not be necessary to trouble the Committee with the details of the Order, because an agreement had practically been arrived at with the Urban District Council, who were the only opponents. The object of the Order was to incorporate the Tipperary Gas Company, who had been working without statutory powers for very many years. The Order was in the usual form, and had been consequent upon a lengthy local inquiry, which had occupied no less than five days. In order to meet the Council, two concessions

had been made—namely, a reduction of the maximum price from 5s. to 4s. 6d., and a clause would also be inserted giving the Council protection in regard to a number of subsidiary details.

Mr. VESEY KNOX agreed with Mr. Hutchinson's statement, and expressed pleasure at having been able to arrive at an amicable conclusion to what had been a very long contest. This was the third instance in which the Company had come to Parliament for powers. In the first place, they went to the Board of Trade ten years ago; but the Order was rejected. In 1910, they brought a Bill before Parliament; but a Committee of the House of Commons put into it certain clauses which the promoters did not feel able to accept, and the measure was withdrawn. They had now promoted the present Order; and he would only say that he was very glad they had been able to arrive at a conclusion which would give the Company statutory powers, and enable them to carry on their business to their own advantage, as well as to that of the Council and the consumers. There was one other matter he wished to mention; and it was one in which he had the sympathy and support of the Company. In consequence of the Council's opposition to the Company in the past, a very heavy bill of costs had been incurred; and he felt bound to add that the results had justified the oppositions. They had, nevertheless, involved considerable expense; and he would ask the Committee to allow the Council to borrow for a period of five years, in order to repay the costs. There were at least two cases this session where Parliament had allowed a similar course to be adopted. The Local Government Board of Ireland had been approached upon the matter in 1910; and they took a very sympathetic attitude with regard to it. What they said was that they had no power to allow the Council to borrow—the only course was to try to persuade the Parliamentary Committee before whom the Order came to insert a borrowing clause of this description. As a matter of fact, the Local Government Board had allowed the Council to defer payment of part of the costs incurred in 1910, because they felt it was a very special case. Tipperary was a district with a population of 7000 and a rateable value of something under £11,000; so that the rateable value per head was small. If, therefore, the whole of these costs were paid off in one year, it would be a serious burden on the district. Another reason for his application was that there had been a great deal of ill-feeling against the Company in these proceedings; and it was desirable that these should die away, and a better understanding obtain in the future. If, however, these heavy costs were imposed upon the ratepayers in the course of one year, it might easily tend to prevent this better feeling.

Mr. HUTCHINSON supported Mr. Knox's application, and said he had no objection to the clause going into the Bill.

The CHAIRMAN, after consulting with the Committee, said he would ask the opinion of the Lord Chairman's Counsel on the matter.

Later in the day,

The CHAIRMAN announced that the Committee had decided that the Council might borrow for five years in respect of the payment of parliamentary expenses, consequent on the promotion of the Bill.

Mr. VESEY KNOX pointed out to the Committee that his original application was intended to include the expenses in 1910, and he quoted the precedent of the Dublin Corporation, where costs incurred in respect of a previous year had been allowed to be repaid over the period.

The CHAIRMAN said that the Committee could only allow the costs so far as they had been incurred in Parliament.

Mr. VESEY KNOX said that the clause, as at present drafted, did not have this limitation, on account of a large proportion of the costs this year having been in respect of a local inquiry, which technically was not "in Parliament."

After further discussion, it was decided to leave the matter to be settled between the Agents and the Lord Chairman.

The Order was therefore sent forward for third reading, on the understanding that the District Council would not be prejudiced in any further discussion with the Lord Chairman as regards this clause.

The Order provides that the share capital of the Company shall not exceed £14,000, which includes the original capital and additional capital to the extent of £4000. Additional lands are also scheduled; and the clauses are those usually inserted in modern Gas Orders. There is no chemical clause.

LOCAL GOVERNMENT PROVISIONAL ORDERS (GAS).

A Bill to confirm Provisional Orders granted by the Local Government Board relating to the gas undertakings at Bala, Harrington, and Hipperholme was passed by the Unopposed Bills Committee of the House of Lords last Tuesday. The Orders have already passed the House of Commons, and were referred to in the "JOURNAL" for June 18, p. 908. The only amendment of importance between the two Houses is provision for notice of discontinuance of supply being given orally as well as in writing.

Seville Water-Works Company.—Presiding at the meeting of this Company last Friday, Mr. Cowley Lambert presented a report which showed that, in the past working year, the income of the Company amounted to £40,895. After deducting working expenses, the cost of laying on services, and debenture interest, the net profit was £9502, as compared with £8826 in the previous year. To this sum had to be added the unappropriated profit of £4249, making the amount standing to the credit of profit and loss account £13,751. The Directors recommended a dividend of 3½ per cent. on the share capital, free of income-tax. This would absorb £9533; and leave £4218 to be carried forward. The Chairman, in the course of his speech, referred to the new river scheme for the supply of the city. Considerable time, it was pointed out, had been necessary to complete the details of the negotiations with the Municipality for the new supply. The Directors were, however, happy to state that a complete agreement, satisfactory both to the Municipality and the Company, had now been arrived at; but they understood that some months must still elapse before the project could receive the necessary approval of the authorities in Madrid.

LEGAL INTELLIGENCE.

IS NATURAL GAS A MINERAL?

The Judicial Committee of the Privy Council, consisting of the Lord Chancellor, Lords Macnaghten and Atkinson, and Sir Charles Fitzpatrick (Chief Justice of Canada) had before them last Thursday a point of scientific as well as legal interest in an appeal in an action originally brought by Mr. Alexander Farquharson against the Barnard-Argue-Roth-Stearns Oil and Gas Company, Limited, the Alexandra Oil and Development Company, Limited, and the Canada Company.

The respondent is the owner of certain lands granted in fee simple by the Canada Company in 1867. The deed conveyed all the right, title, and interest of the Company to and in the land and every part of it; but it contained an exception reserving to the Company, their successors, and assigns "all mines and quarries of metals and minerals, springs or oil, in or under the said land," with the right to work them. The Oil and Gas Company and the Oil and Development Company are lessees or licensees from the Canada Company of the oil and natural gas in and under the lands purported to have been conveyed by the deed of 1867; and they "won" and carried away oil and natural gas therefrom, and are still so working. The Court of First Instance was in favour of the plaintiff; and the judgment negatived the rights of the Companies, as far as concerned the natural gas, but gave no relief to the plaintiff with regard to the oil. The plaintiff did not appeal from the judgment, and it was therefore the right of the Companies to the natural gas which alone was in question on appeal. The Court of Appeal, by four to one, decided against the Companies, who thereupon instituted the present appeal; submitting that they were entitled to the natural gas.

Sir ROBERT FINLAY, K.C., Mr. HELLMUTH, K.C., and Mr. S. A. T. ROWLATT (instructed by Messrs. Freshfield) appeared in support of the appeal; Mr. DANCKWERTS, K.C., and Mr. MACINNES, K.C. (instructed by Messrs. Blake and Redden) represented the respondent.

For the appellants, it was contended that the words included natural gas, which, it was argued, was a mineral and scientifically identical with oil. Natural gas, it was submitted, was one of the products of an oil spring, and the practical working of such gas was not severable from that of mineral oil. For the respondent, it was argued that, upon the true construction of the exception, it did not include the natural gas. Not in the ordinary meaning of the words used, nor in the minds or intention of the parties to the conveyance, nor in the vernacular of the mining world, the commercial world, and landowners in 1867, did the words employed in the exception include natural gas. This gas and mineral oil were generally found in distinct wells.

At the close of the arguments, judgment was reserved.

Claim in Respect of a Gas-Radiator Fatality.

It was intimated in the Court of Session on Saturday that a settlement had been effected in the action which was to have been tried yesterday, in which Mrs. Agnes Boyd, or Brown, St. Bernard's Place, Edinburgh, and her three children, sued for £800 damages from Messrs. Sack and Renwick, jobmasters and carriage hirers, Bell's Brae, Edinburgh. The husband of the pursuer and father of the children was in the employment of the defenders, and on the night of Nov. 19, when in the harness room, engaged it was averred in hanging up a set of harness, an apron which he was wearing became ignited at the gas-jets at the foot of a radiator, with the result that he died from the injuries he received. It was alleged that the radiator was defective, and that draughts so affected the gas-jets that their direction and extent over the floor could not be foreseen. The defenders denied fault, and pleaded contributory negligence on the part of the deceased. Under the Workmen's Compensation Act, they admitted liability for £175. The defenders have paid £350 and expenses in settlement of the pursuer's claim.

Claim for Water Rent.

At the Plymouth County Court, yesterday week, the Saltash Corporation were the plaintiffs in an action in which £1 9s. 2d. was claimed for water rent; the defendant being Mr. Arthur Geake, solicitor. Mr. J. A. Hawke, who appeared for the Corporation, explained that, under the Public Health Act, authorities supplying water could make a rate upon the rateable value of the consumer's property or charge a water rent. They could also charge the water undertaking upon the general district rate, and not upon the consumers only; but if they took this course, five or ten ratepayers might call upon the authority to make a water rate or fix a water rent. The ratepayer, however, was not empowered to say whether it should be rent or rate. The Saltash Corporation elected to make the charge by means of a rent. In effect, the result was the same, and whether the amount were levied at 1s. in the pound on the rateable value or 9d. on the gross value, they paid the same sum of money. Mr. Geake had been supplied with water since 1901. Formerly the charge was 1s. in the pound up to a rental value of £30 and 6d. on property of higher value; but the Corporation, having been put to additional expense, raised the charge in 1911 to 1s. 2d. in the pound. A meeting of ratepayers was thereupon held, with Mr. Geake in the chair, and a resolution was passed protesting against the new charge. Mr. Geake, in correspondence with the Council, said he was willing to pay if they would adopt reasonable means of raising the money by a water rate. As to the reasonableness of the charge, the fact was that the Corporation were actually losing a little on the water undertaking. Mr. Elliot Square, for the defence, contended that there was no agreement on the defendant's part to pay the higher charge. His Honour Judge Lush-Wilson held that the use of the water and defendant's threat that if it were cut off he should apply for a mandamus, implied that he agreed to pay a reasonable price for it. That the price was reasonable was shown by the fact that there was a deficiency, and not a profit, on the working of the undertaking. Judgment was accordingly given for the plaintiffs, with costs.

MISCELLANEOUS NEWS.

COMPULSORY PURCHASE OF GAS UNDERTAKINGS.

Precedents for the Insertion or Refusal of a Purchase Clause.

In the course of the proceedings on the Fleetwood Gas Bill before the Duke of Bedford's Committee, as reported in the "JOURNAL" for the 2nd inst. (p. 61), three documents were handed in, giving the cases in which compulsory purchase had been authorized or refused. As these lists may be useful for reference, we avail ourselves of an opportunity which has been afforded us of reproducing them.

Cases in which Compulsory Purchase of Statutory Gas Undertakings was Authorized by Bills promoted by Local Authorities not in pursuance of a Purchase Clause.

Barry (1893). Devonport (1901).* Filey (1898). Ilkley (1892). Loughborough (1899). Morley (1898). Ossett (1900). Pontefract (1906). Prestatyn (1909). Skipton (1899).* Ystradyfodwg (1896).

* After agreement.

Cases of Purchase Clause Inserted in a Company's Bill.

STATUTORY COMPANIES.

Aberystwyth (1898). Bridgwater (1903). Brixham (1906). Colwyn Bay (1896). Garw and Ogmore (1908). Long Eaton (1901).* Otley (1901).* Rickmansworth (1902).* Scarborough (1895). Shrewsbury (1901). Sidmouth (1911). Swindon (1902). Swinton and Mexborough (1908). Whitby (1904). Wolverhampton (1900).

* Working under Provisional Order.

NON-STATUTORY COMPANIES.

Ammanford (1908). Ashbourne (1911). Bishop's Stortford (1904). Bude (1907). Chard (1902). Chesham (1911). Chippenham (1904). Cowes (1896). Dowlais (1906). Harpenden (1901). Hitchin (1905). Llandrindod Wells (1907). Newtown (1899). Omagh (1901). Petersfield and Selsey (1901). Rugeley (1900). Rushden and Higham Ferrers (1899). Truro (1906). Tuxford and District (1897). Wellington (1904). Whitwick and Coalville (1898). Wicklow (1910).

In most of the preceding cases the purchase clause was inserted by agreement. The clause was refused by the Lords in the case of Cowes, but was inserted by the Commons. In the cases of Ammanford and Llandrindod Wells, it was to be operative after twenty-one years.

Cases of Refusal to Insert a Purchase Clause in Bills Promoted by Gas Companies.

STATUTORY COMPANIES.

Accrington (1893).* Bognor (1904). Broadstairs (1902).† Cleethorpes (1900). Derby (1890). Elland (1901). East Hull (1906 and 1907). Farnham (1910). Gosport (1908). Hartlepool (1900).† Ilford (1899). Ilkley (1892).‡ Lea Bridge (1899).† Longwood (1902).* Matlock and District (1904). Merthyr Tydvil (1906). North Middlesex (1895). Norwich (1896). Pudsey (1887). Sidmouth (1911). Southend (1892). Swansea (1888). Weymouth (1897). York (1912).

NON-STATUTORY COMPANIES.

Ashbourne (1911). Cowes (1896).§ Hitchin (1905).‖ Stirling (1898). Syston and Thurmaston (1902).

* Refused by Lords; inserted by agreement in Commons. † Refused by both Houses. ‡ Refused by Commons; inserted by agreement in Lords. § In Lords only. ‖ In Commons only.

SULPHATE OF AMMONIA COMMITTEE.

Fifteenth Annual Report.

The Annual Meeting of the Sulphate of Ammonia Committee was held at the Midland Grand Hotel, St. Pancras, on the 12th inst., when the report for the twelve months ended June 30, which bore the signature of the Chairman (Mr. Thomas Milne), and was issued from the offices, No. 4, Fenchurch Avenue, E.C., on the previous Tuesday, was adopted. The following are the principal portions of the report.

During the period under review, a total number of 37 lectures were delivered by Mr. Bloxam to agricultural societies and farmers' clubs—viz., in England, 31; in Wales, 5; and in Scotland 1. It is to be regretted that there was such a preponderance of lectures in England. The Scottish societies were approached at the same time and in the same manner as the English societies; but the Committee's offers were not taken up nearly so readily in Scotland as in England. During the 1911 season, 78 competitions for the Committee's money prizes were organized by agricultural societies and farmers' clubs distributed throughout the United Kingdom, as follows: In England, 54; in Scotland, 14; in Ireland, 8; and in Wales, 2. It will be remembered that, owing to the exceptionally dry season, 1911 proved in most districts a very unfavourable year for root crops; and mainly for this reason 23 of these competitions fell through, owing to lack of entries or to farmers withdrawing their crops from competition. By a slight alteration in the conditions of the competitions, they have become more popular among farmers, with the result that 97 competitions have been organized for the current year, distributed as follows:

	Societies.		Competitions.
In England	50	..	69
,, Scotland	12	..	20
,, Ireland	6	..	6
,, Wales	1	..	2
Total	69	Total	97

Notwithstanding the unfavourable climatic conditions of 1911, some exceedingly heavy crops were recorded, the heaviest (per acre) in their respective classes being—

Crop.	Tons.	Cwt.	Crop.	Tons.	Cwt.
Turnips	36	17	Mangels	58	12
Swedes	58	10	Potatoes	22	13

These heaviest crops were obtained as follows: Turnips in Fifeshire, swedes in Queen's County, mangels in Derbyshire (a record crop for the district), and potatoes in County Down.

The small-area plot work, which was commenced in 1910, has increased enormously, as the following figures will show:—

Year.	No. of Supervisors.		No. of Plots.
1910	27	..	673
1911	52	..	1504
1912	86	..	2924

The plots laid down in 1912 are distributed over the United Kingdom as under:—

In England	1950	plots under	60	supervisors
,, Wales	534	,, ,,	17	,,
,, Scotland	260	,, ,,	8	,,
,, Ireland	180	,, ,,	1	,,
Total	2924	,, ,,	86	,,

As in the case of 1911, all the Irish plots are under the supervision of Mr. W. M. O'Friel, who is devoting his whole time to the work.

The great increase in the volume of the plot work necessitated a very considerable addition to our staff of local supervisors. Before the present season, the Committee had been almost entirely dependent on the recommendations of Professors of Agricultural Colleges for the provision of properly qualified supervisors; but this year we were enabled, through the assistance of Secretaries of Chambers of Agriculture, Agricultural Societies, &c., to get into touch with a number of suitable men able and willing to undertake the work. Last year each supervisor had, on an average, 21 plots under his supervision; but this season each has 30 to look after for the same remuneration.

Mr. Glover, of the British Gaslight Company, of Norwich, informed us that a factory for the production of sugar from home-grown sugar-beet was about to be established at Cantley, in Norfolk, by the Anglo-Netherlands Sugar Corporation, who have also entered into contracts with farmers in Norfolk and Suffolk for the supply of roots necessary to feed the factory. This circumstance was considered to offer such an excellent opportunity of demonstrating, on a commercial scale, the value of sulphate of ammonia as the best nitrogenous manure for sugar-beet, that the Committee entered into an arrangement with nineteen prominent farmers in Norfolk and Suffolk whereby it was agreed to supply them with the necessary artificial manures and lime for some 120 acres of land placed under this crop. As supervisor of these experiments, the Committee were able to secure the services of Mr. Henry Giles, of Norwich, who is an experienced agriculturist, in close touch with all the leading farmers in Norfolk and Suffolk, who was thus able quickly to obtain suitable men to carry out experiments for us.

In addition to these large-scale experiments, two acres of land have been laid out in one-tenth acre plots, on which are being tested new methods of manuring, with a view to ascertaining whether any improvement in weight of crop or sugar contents can be obtained.

Continental propaganda work is being carried on energetically; and the extremely good demand from abroad and the exceptionally high prices which have been such a prominent feature during the past year are strong evidence of the good results to be obtained by working in a friendly manner with the important Continental Syndicates. Propaganda work in South Africa is engaging the attention of the Committee; but there is much information to be obtained before it can be decided that it would be wise to carry on work there regularly. The visit of Mr. W. M. Carr (1910-11) has resulted in our obtaining many valuable facts which would not otherwise have been at our disposal, and which will help the Committee to arrive at a decision.

The question of undertaking propaganda work in British India has also been receiving the careful consideration of the Executive; and correspondence has been carried on with various Government Agricultural Colleges and Departments of Agriculture with a view to obtaining reliable data as to the prospects of successfully using sulphate of ammonia in India. The information received points to the probability that, in certain districts and for certain crops, India presents a wide field for successful propaganda work; but there are many drawbacks and limitations requiring further careful consideration.

During the financial year just ended, 36 new subscribers have joined the Committee:

	Producing in Terms of Sulphate of Ammonia.
7 coal, coke, and iron firms	8,350 tons
17 gas undertakings making sulphate	3,050 ,,
12 ,, ,, not making sulphate	7,000 ,,
Total	18,400 tons

The total increase during the year in contributing tonnage, due to new subscribers and to the augmented output of members, is 28,457 tons. Thus, largely through the assistance given by subscribers in all parts of the country in securing new members, we have in the last two years added 64,749 tons to our subscribing tonnage.

Though our appeal to those gas undertakings which do not make sulphate of ammonia to become subscribers, on the basis of an annual subscription of 7d. per million cubic feet of coal gas produced, has not met with the response anticipated, it has been fairly successful. We now have on our list of members 23 undertakings which contribute on their coal-gas production, amounting in the aggregate to some 16,000 million cubic feet per annum.

The Executive Committee are constantly making efforts to secure the support of non-subscribing makers; and it is felt that members generally could greatly assist them in this endeavour by bringing their influence to bear on any of their neighbours who have not joined our Association. The Committee will be pleased to supply members prepared to so assist the Executive with lists of subscribers and non-

subscribers, and any other information desired. The Secretary is most assiduous in his efforts to obtain new subscribers; but it has been proved in the most convincing manner that non-subscribers are much more influenced by the representations of makers known to them than by official applications.

Thus, every subscriber is urged to obtain the adhesion of at least one maker during the new financial year. It cannot be too seriously impressed upon all that everyone benefits largely by our work, and should gladly subscribe the less than 1s. per ton required. Values can only be maintained by constant and new propaganda work in all parts of the world.

The exceptionally high price of sulphate of ammonia during the spring months, and the strong demand from abroad, coupled with the shortage of supplies caused by the coal strike, is thought to have adversely affected the home consumption.

EUROPEAN GAS COMPANY, LIMITED.

Increased Business—Prolongation of the Rouen Contract.

The Annual General Meeting was held last Tuesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. H. E. JONES (the Deputy-Chairman) presiding.

The DEPUTY-CHAIRMAN remarked that he was sorry to say he appeared before the shareholders in the position of a substitute. Their worthy Chairman (Mr. R. Hesketh Jones) was a little overcome by the heat, and was advised not to come to the meeting. His indisposition was very light, and only temporary.

The SECRETARY (Mr. W. B. Brady) read the notice convening the meeting, as well as the annual report of the Directors and the accounts. The report was as follows:—

The increase in the sales of gas has been 4¾ per cent.; and the increase in the number of consumers is 4657.

The efficiency of the manufacturing and distributing plant at the several stations has been fully maintained.

After protracted negotiations, the Directors have pleasure in reporting that they have secured an extension of the Rouen contract until 1946. The average length of the Company's concessions is now 29 years.

The investments are quoted in the balance-sheet at Stock Exchange values on March 31 last.

In the report submitted to the shareholders at the annual meeting on July 11 last, the Directors stated that "they proposed in future to equalize the half-yearly dividends by distributing 10s. per share each half year, instead of, as heretofore, a larger part of the year's dividend on Aug. 1." This proposal was confirmed by the shareholders, and is now acted on. A dividend of 10s. per share was paid on Feb. 1; and the Directors now recommend a similar dividend from the year's profits, carrying the balance, £1153 5s., to general revenue account. The dividend will be payable on Aug. 1.

The Directors who retire by rotation are H. E. Jones, Esq., M.Inst.C.E., and R. S. Gardiner, Esq., and the retiring Auditors are J. Reeson, Esq., and H. J. Luff, Esq., who, being eligible for re-election, offer themselves accordingly.

Mr. W. WILLIAMS (the Managing-Director) read the following memoranda on the position of the affairs of the Company, prepared by the Chairman (Mr. R. Hesketh Jones).

The balance-sheet which has been read by the Secretary is, I think you will admit, very satisfactory. The capital expended on works, mains, and plant is £962,433, against which we have the redemption account of £496,932, leaving £465,500 to be amortized in the future. This £496,932 is more than provided for by investments in Government, Colonial, Corporation, County, and other substantial and realizable securities, of the Stock Exchange value of £546,341 on March 31 last. The expenditure on land (which is all freehold) is £140,217. This includes a large property at Nantes, with extensive and very substantial buildings, which we purchased about six years ago, and have subsequently let on a repairing lease, retaining a portion for the Company's purposes. The stocks of coal and materials, book debts, and cash in France amount to £161,562, against which there are sundry creditors £73,170; and, after payment of the proposed dividend on Aug. 1, there will remain £123,440 to the credit of general revenue account. At Whitsuntide, the Deputy-Chairman and Managing-Director inspected the several stations in France; and they will no doubt give you some information thereon. I will content myself by quoting the short paragraph in the report: "The efficiency of the manufacturing and distributing plant at the several stations has been fully maintained." The report mentions the fact that the long-pending negotiations for an extension of the concession at Rouen, where we share the lighting with a local company, have been completed. The treaty was finally approved on May 2 last; the reduced price of gas commencing on June 1. The old contract, which would have expired in 1923, has been extended until May, 1946, in exchange for various reductions in the price of gas and other concessions. We look forward to an increase in the sale of gas at Rouen, consequent on the reduction in the price; and we are fully prepared to meet whatever demand may be made upon us. In addition to the pensions to workmen recently provided for by the French Government, the Directors last summer formulated a scheme for additional pecuniary advantages to their staff and workmen. This was submitted to, and cordially approved by, the shareholders at the meeting held on Oct. 17 last, and subsequently explained by the staff in France to their workmen. The scheme gave them the option, on or before Jan. 1 last, either to join the "Caisse Nationale" or the existing Company's pension fund. Some 835 men selected the "Caisse Nationale," and 684 preferred the Company's pension scheme, which latter is now limited to its present members. It is pleasing to be able to report that this voluntary action of the Company in regard to these pension funds has been met with gratitude, verbally and in writing.

The DEPUTY-CHAIRMAN, in moving the adoption of the report and accounts, said the Chairman had given the shareholders such an excellent *résumé* of the proceedings that there was not much to add to it. It must be gratifying to learn from the report that there had been the satisfactory increase of 4¾ per cent.—nearly 5 per cent.—in the consumption of gas, which rate was equal to a doubling of the business in fourteen or fifteen years. It was a rate that was considered to be very good in this country, where advance was made perhaps a little more freely, owing to the gas undertakings not working under concessions more or less limited. The shareholders would be gratified to learn that the Rouen concession had been extended, and that the balance of the whole of the concessions remained at the satisfactory figure stated in the report, because this meant that the average life of the concessions was prolonged. They had heard from the Chairman what a satisfactory balance there was on the securities representing the redemption account. It would also be pleasant to learn that these securities had been written-down, at the expense of the revenue account, to the fair market value. They had had to make considerable sacrifices of profits for some years past in maintaining the depreciation which had attached to all gilt-edged securities of every kind throughout the kingdom. With regard to the works, he had the pleasure of visiting the stations with the Managing-Director in May; and they found them in excellent order. He ought to tell the shareholders that for some years past the Directors had been revising the carbonizing plant at the works, and installing modern recuperative furnaces, which were now found on every first-class works. They were substituting these for the older systems; and in this way they would hope to get considerable improvements in the carbonization returns, so far as the production of gas was concerned. This change was in process of being carried out. They had attacked the largest works first, and had been gradually installing the system in the smaller works. At the same time, they had increased the purifying power at the various stations. Of course, in renewing concessions as they had done at Rouen, they had had to take a lower price for gas. There was, however, a merciful compensation in these things. The cheaper supply of gas induced a larger consumption; and the larger consumption induced manufacture on a larger scale, which worked out at a lower rate per unit of production in respect of the fixed charges. This enabled them to adopt modern improvements—in fact, these reductions of price, while at first they touched the profits, in the end brought such an increase of business that, on the balance, they were not much the worse off, and often something to the good. With the experience that he had of these matters, he could say that he looked upon the Company's properties as among those of the highest class of which he knew the world over. He was associated with gas-works in the Far East, in South America, in Europe, and in England; and he could assure the shareholders that no gas-works showed a better condition, or had more assiduous care bestowed upon their working, than those of this Company. The practice of visiting them every year was one which was satisfactory in keeping them up to the mark, and also enabled the Directors to speak with confidence as to their condition. He had not touched upon one subject which must have the entire sympathy and support of the shareholders. They recollected the terrible coal strike, which suspended the delivery of coal for something like two months, and in the case of this Company for a longer period, because the coal could not be delivered by shipping, even when the collieries were started, for a further ten days or so. This Company, like most of the leading companies in England, made a heroic stand. They spared no effort whatever. They carefully looked forward, and made every preparation they could; and not in any single town, large or small, in France, was there a hitch in the gas supply. This showed the success of the anxiety and care of their Managing-Director and of the Board, and the Managers on the spot, who were devoted to the Company's service. It showed also a foresight which enabled the Company to weather such a disastrous state of things so successfully. He could not raise his voice at any meeting of gas shareholders at this time without referring to this extraordinary trial. In all his forty and more years' experience, he never remembered such a condition before; and the way in which the gas companies of England, and the English gas companies working abroad, had contended with this condition, and had succeeded in averting any inconvenience to the consumers throughout such a large industry as this, was nothing less than heroic, and it might even be called noble, in view of the sacrifice made—a sacrifice made, not only in this Company but in other companies, of large money expenditure and great efforts.

Mr. H. C. SMITH seconded the motion, which was unanimously carried.

The DEPUTY-CHAIRMAN proposed the confirmation of the dividend already paid of 10s. per share less 7d. per share in respect of the shares held in France; and the declaration of a final dividend of 10s. per share, free of income-tax, subject to a deduction for French tax and transfer duty, on the shares held in France.

Mr. R. S. GARDINER seconded the motion, which was unanimously carried.

Proposed by Mr. H. C. SMITH, seconded by Mr. A. T. EASTMAN, Mr. H. E. Jones and Mr. R. S. Gardiner were re-elected members of the Board.

Moved by Mr. A. F. PHILLIPS, and seconded by Mr. F. M. FRY, the Auditors (Mr. J. Reeson and Mr. H. J. Luff) were re-appointed.

The DEPUTY-CHAIRMAN said he should like to move a vote of thanks to the Company's staff. He had described the anxiety which had attached to the period since their last meeting. He was bound to tell the shareholders that during the entire year they had had wholehearted and generous support from all their officers. He was not sure that he ought not to include their excellent friend and colleague, the Managing-Director, who was everywhere and always where anything had to be done. Mr. Brady, the accountants, and the clerks were ever at their posts. There was the large staff of another nationality, to whom the shareholders were very especially indebted. When one visited the works, as he (the Deputy-Chairman) had done with the Managing-Director now for some years, it was a most pleasurable thing to experience the cordiality and good-fellowship of their officers and staff, who were thoroughly loyal to the interests of the Company. They were all of them men of experience and men of technical knowledge—many of them had qualifications of a technical character and of the highest distinction; and they looked after the profits, losses, and incidents of the whole business in a spirit which was so thrifty and painstaking as to excite one's wonder and admiration. They were admirably backed up by their assistant engineers, foremen, and staffs.

He (Mr. Jones) was sure the shareholders would like to extend to them all, including the men, their hearty sympathy and gratitude.

Mr. R. S. GARDINER, in seconding the resolution, said he was personally acquainted with many of the officers abroad; and therefore he could truthfully and sincerely support every word of commendation which the Chairman had expressed with regard to their services.

Mr. WILLIAMS responded on behalf of the whole of the staff at home and abroad. He assured the shareholders that they had a most devoted and efficient staff, who at all times did, and at all times would continue to do, their utmost to further the Company's interests. When this vote of thanks was conveyed to them, they would, he was sure, fully appreciate it.

Moved by Mr. FRY, and seconded by Mr. PHILLIPS, a hearty vote of thanks was passed to the Chairman and Directors.

The DEPUTY-CHAIRMAN expressed the thanks of himself and his colleagues; and the proceedings concluded.

PROFIT-SHARING AND CO-PARTNERSHIP.

[From the Board of Trade Labour Gazette.]

An examination of the returns already received in connection with the inquiry into profit-sharing and co-partnership, which is now being made by the Labour Department, has shown that the schemes adopted in different cases exhibit a very interesting variety of type; and it is thought that a concise epitome of the systems adopted in the first hundred schemes at present in operation, the investigation of which has been completed, may be of value at the present time as a preliminary survey in advance of the full report which will be published in the autumn.

With respect to the character of the profit-sharing agreement, whether a strict legal contract or a voluntary arrangement, most of the schemes make no express reference to this point. In regard to those which explicitly deal with the subject, it is found that in a few instances only is the share in profits which is allotted to the employees given to them as a matter of strict legal right, while in a certain number of cases it is expressly declared that no legal rights are conferred, or that the bonus (share in profits) is given gratuitously.

DETERMINATION OF BONUS FUND.

In the majority of cases the total amount allotted for distribution among the employees as bonus is a fixed proportion of the profits; but in a small number of cases participation stops at a certain point, beyond which the claims of the employees cease. In a small number of cases the amount available for the payment of bonus is not a proportion of the profits, but a sum contingent upon a certain rate of profit being earned by the business—this sum being in some of these cases a fixed percentage on wages, and in others an amount ascending with the rate of profit earned.

With profit-sharing gas companies, the bonus depends upon the price of gas. These companies are by law allowed to increase their dividends beyond a certain point only in proportion to a reduction in the price charged by them for gas. In gas companies, accordingly, the bonus, instead of varying directly with profits, varies with the same factor which governs profits, and rises as the price of gas falls.

THE DIVISIBLE PROFITS.

The profits taken into account for the purpose of ascertaining the amount available for distribution as bonus are almost invariably the profits earned in the year, or in a certain number of cases the half year, preceding the distribution; but in a few cases a part of the profits of each year is carried forward, in order to enable a bonus to be paid in an occasional bad year.

The divisible profits for the purposes of the profit-sharing scheme are usually declared to be the clear or net profits—that is to say, the gross profits after deduction of rent, taxes, rates, wages, salaries, and other working expenses. In joint-stock companies, the salaries include those of managing and other directors, and an analogous practice obtains with a few private firms, though, as a rule, in such firms, the remuneration of management is included in the proportion of the profits not allotted to employees, but retained by partners. As to the minimum remuneration of capital, interest at fixed rates is usually included, whether in the case of joint-stock companies or of private firms, among the deductions to be made before "net profits" are arrived at—this rate being generally 5 per cent., sometimes 6 per cent., and only exceptionally a lower or a higher percentage. In some cases special mention is made of sums to be set aside for depreciation and for reserve funds.

The "reserved limit"—*i.e.*, the point at which the participation of the employees begins—is in a few cases known to be based, not on the actual profits earned in the years immediately preceding the introduction of the profit-sharing scheme, but on an amount below these profits. The principle upon which the reserved limit is calculated is generally communicated to the employees; and the results of the calculation determining the total amount available for participation are in a certain number of cases certified by professional auditors, whose figures can be seen by the employees. In a few cases the employees are allowed to inspect the books of the firm.

SHARE IN PROFITS ALLOTTED TO EMPLOYEES.

The proportion of the profits allotted for division between the employees varies considerably in different schemes. In instances in which no mention is made of any part of the total net profits being retained for the employers as a reserved limit, there are a few cases of 10 per cent. of the profits being allotted as the share of the employees. A case of 5 per cent. is mentioned, and another in which the share of the employees is 2½ per cent. of the divisible profits up to a certain sum, and 5 per cent. of the profits in excess of such sum. In a very small number of cases capital and wages share concurrently; the bonus being at the same rate on wages as the rate of interest received on the capital. It is, however, necessary to state that, for the most part, the returns in these cases contain no information as to the percentage in question. Where a reserved limit is mentioned, the proportion of the surplus profits above this limit, which, so far as is known, is appropriated to the payment of bonus, varies from 5 up to 50 per cent.—well over one-third of the schemes in question allotting the latter percentage, and nearly one other third giving from 20 to 25 per cent. In a certain number of cases the surplus is shared between capital and wages *pro ratâ*.

With regard to the division of the total bonus fund among the different employees, by far the most common method adopted is to divide this fund between the participants in proportion to the amount which each has earned in the period to which the distribution relates, no deduction being in many cases made for time lost by illness up to a certain limit. But in making the calculation overtime is excluded in a few cases, and overtime and piece-work in a considerable number of schemes. In a few cases other elements—such as length of service, or the nature of the duties performed by the employee—are taken into account; and in a very small number of schemes the share to be assigned to each employee is fixed by the employers at their discretion.

PROFIT-SHARING DEPOSITS.

With respect to the not very numerous cases in which the form of profit-sharing adopted, either exclusively or in conjunction with the more common type, consists in paying to employees who leave money in the hands of their employers in the first place a fixed rate of interest (usually 4 per cent.), and then a further return on these deposits varying with the rate of profits of the business, this extra return is in a few cases of such amount as, together with the fixed interest, will bring the total return up to the dividend paid by the company—in some of these cases with a maximum limit of 10 per cent. In a very small number of cases the extra return is to be one-half of the difference between the minimum interest and the dividend paid by the company, with a maximum limit of 7 or 10 per cent.

SPECIAL EMPLOYEES' SHARES.

Where employees hold shares which they have bought in the market, they are not considered to be employed under the method of profit-sharing. But where shares are issued to employees either without exacting any payment or on special favourable terms as to purchase price or method of paying up instalments, &c., this is a form of profit-sharing; and cases of this nature, though not frequent, are to be found among the schemes now under examination.

CONDITIONS ATTACHED TO PROFIT-SHARING.

In some cases all the employees without distinction are allowed to share in the bonus fund; but in many instances participation is confined to persons who possess certain qualifications, the most frequent of which is a certain length of service with the firm, varying from six months up to seven years—the most general period named being one year. In a few cases persons below a certain age are excluded. In a small number of schemes participation in profits is confined to employees selected by the management. In a few instances certain classes of employees—such as persons receiving commission, piece-workers, or casual labourers—are excluded from participation. In certain instances conditions are attached to participation. By far the most frequent is the signing of a contract of service for a stated period, generally twelve months, as is the case with nearly all profit-sharing gas companies; this contract providing that wages shall not be reduced during the term specified. In a few cases, profit-sharing employees are required to be members of a fund for provident purposes.

FORMS OF BONUS PAYMENT.

In about one-half of all the schemes under examination the bonus is paid in cash; in a considerable number, part (generally one-half) of the bonus is paid in cash, the remainder being credited to a thrift fund available to provide provident benefits for the employees, as a rule, individually, but in some cases collectively—this fund being usually deposited at interest with the employers. In a very small number of schemes the whole of the bonus is devoted to provident purposes. Under many schemes one-half of the bonus is retained for investment in the capital of the undertaking by which the participant is employed; but in a not inconsiderable number of cases the whole is so retained until the employee holds a certain amount of stock. Subject to this retention, the other half is either paid out in cash or retained on deposit with the employers unless permitted to be applied for purposes of a provident character. In a few schemes the whole of the bonus is invested in the shares or stock of the employing company. In a few cases shares obtained by the investment of bonus cannot be disposed of except with the permission of the employers, and many schemes provide for the loss of his right to share in profits by any employee selling without permission.

SHARE IN CONTROL OF BUSINESS.

As a rule (to which, however, there are important exceptions), the shares owned by the employees give them the ordinary voting powers; and as time goes on, and their holdings increase, their voting strength should in due course be augmented. At present, the proportion of the total number of votes that might be given at a general meeting of shareholders, which belongs to the employees, hardly ever reaches 5 per cent., and is in nearly all cases a quite insignificant percentage. In only six out of the hundred cases here dealt with are the employees represented on the Board of Directors. There exist, however, under a very large number of profit-sharing schemes, joint committees, composed of employers and employed, whose functions, though of a consultative nature only, cannot be considered as other than important.

Gas-Workers' Conditions at Penrith.—Following some trouble with the men, the Penrith Urban District Council have, at a special meeting, adopted a recommendation of the Gas Committee that the conditions of employment at the gas-works should be amended so as to provide: Pay at the rate of 5s. per twelve-hour shift. Holidays allowed with pay—Summer, one week; Christmas Day, New Year's Day, and Good Friday. No Sunday work, except when ordered by the Manager, for which pay will be at the rate of time-and-a-half. A fortnight's notice to terminate engagements, except for misconduct.

SALFORD CORPORATION GAS DEPARTMENT.

The Past Year's Working.

As has already been briefly recorded in the "JOURNAL," the report of the Gas Committee of the Salford Corporation has been presented to the Town Council by the Chairman (Mr. F. S. Phillips), and adopted without discussion. In the report the Committee express their pleasure in stating that the usual growth in the number of consumers has been maintained during the past year. The sales of gas have, however, shown a slight decrease, equal to 0·12 per cent., due to the sale of the rights, powers, and privileges of the Corporation with respect to the supply of gas in the urban district of Little Hulton on March 31, 1911, and to the effects of the national coal strike. The demand for gas appliances generally has been satisfactory, and the business in cooking-stoves has considerably increased. The coal and cannel carbonized during the past year amounted to 163,101 tons, and the quantity of gas made to 1,676,389,000 cubic feet, of an average illuminating power equal to 19·20 standard candles—the parliamentary standard being 18 candles within the borough, and 17 candles as tested in the out-districts. The total receipts realized from residuals show a considerable increase compared with last year. On Feb. 22 and 23 last, the Local Government Board held an inquiry at the Salford Town Hall with reference to the application of the Corporation for further powers in connection with the gas undertaking. The Local Government Board eventually made an Order granting the powers sought by the Corporation, but with certain restrictions as to the allocation of the revenue from the gas undertaking. The Bill containing this Order is now before Parliament.

The accounts show that the net revenue from the sale of gas was £180,846; residuals produced £64,682; and the total receipts were £247,447. The expenditure on manufacture was £125,937; on distribution, £16,646; on management, £8287; and the total expenses were £172,348—leaving a balance of £75,099 to go to the profit and loss account. After meeting interest and redemption charges and allowing £20,793 for depreciation, there was a balance of £18,000 transferred to the district fund account.

EDINBURGH GAS COMMISSIONERS AND IRONMONGERS.

Agreement as to Fitting Gas Fires and Radiators.

After prolonged negotiations, the Edinburgh ironmongers and plumbers, through their Associations, have come to an arrangement with the Edinburgh and Leith Corporations' Gas Commissioners with regard to the execution of work and the terms on which the Commissioners will supply material, &c. The following outline of the agreement appeared in the "Ironmonger" last Saturday.

A trader is to be allowed to connect and fit up complete ready for use gas fires and radiators hired or obtained on the hire-purchase system from the Commissioners by his customers on the following terms: The connecting and fitting-in are to be executed at the rates given in Schedule B, which include the handling of materials supplied by the Commissioners, except solder, white lead, screws, and nails, which the trader must supply without further charge. The trader undertakes without further charge to maintain his work to the satisfaction of the consumer and the Commissioners' Engineer or Inspector for a period of twelve months from the date of fixing.

The trader will be allowed to send his customers to the Commissioners' show-rooms; and where a customer so sent is supplied from the stock of the Commissioners, the charge for the goods will be rendered against the trader. In making up such charge, 33⅓ per cent. will be added to the cost price to the Commissioners and 20 per cent. discount deducted. This refers to appliances other than cookers, grillers, hot-plates, and other domestic apparatus, fires on simple hire and hire-purchase, and high-pressure gas devices. The Commissioners will render monthly accounts to the trader, who will be responsible for payment, and quarterly statements, which must be paid within one month of being rendered. Failing payment, 5 per cent. interest per annum will run against the trader until payment of the net amount.

The Commissioners and trader agree not to sell the appliances at prices less than 33⅓ per cent. over the cost price; the trader undertaking that all goods purchased from the Commissioners are for use within the Commissioners' area of supply. If the customer subsequently has further fixing done by the Commissioners direct, without the intervention of the trader, the Commissioners are to credit the trader with the appropriate discount on payment of their account by the customer. Where a consumer declines to employ his own tradesman, or to select any other tradesman from the Commissioners' list, the Commissioners will do the work, but not undercut the trader.

The trader undertakes to make a reasonable display in the windows and his shop of gas-stoves and other gas appliances (Schedule A); and in consideration of this service, he will be charged a special rate for the gas supplied for lighting, exhibiting, or demonstrating. This gas will be registered by a separate meter; and the arrangement is contingent on payment of accounts being made within one month of the date of rendering The Commissioners will send the trader free circulars, posters, and other literature to advertise the department. They will sell to the trader cookers, grillers, hot-plates, and other domestic apparatus, including such articles as globes, mantles, and shades, charging therefor the trade price (as for, say, a gross of mantles), *plus* 40 per cent., but subject to a discount of 25 per cent. on settlement, on terms similar to the charges for the other goods above mentioned.

The Commissioners will be at liberty to cancel the agreement should their Engineer report that the trader has failed to do the work properly or carry out the terms of the agreement.

SCHEDULE A.

Gas-Fittings and Appliances to be Exhibited by Traders.

Combination ranges and cookers (optional), grillers, hot-plates, baking-plates, boiling-burners, cooking utensils, frame, register, and lustre fires, radiators, flueless stoves, geysers and hot-water circulators and heaters, wash boilers, laundry and tailors' irons. Pendants in one, two, and three lights; and also movable, adjustable, and adaptable patterns; hall, standard floor, table, and reading lamps; brackets, burners (upright and inverted), for inside and outside lighting; reflectors, bead and silk shades, globes; mantles and patent pneumatic and other lighting systems.

SCHEDULE B.

This schedule sets out the rates to be charged by the trader to the Commissioners for work done in fitting-up gas fires and radiators supplied on the hire or hire-purchase system. No connection is to be made to existing gas-fittings without the Commissioners' certificate, nor is piping of less than ½ inch internal diameter to be employed. All material (piping, cocks, and connections) will be supplied and charged to the trader. Upon the Commissioners' inspector certifying the work, the trader will recharge the materials to the Commissioners and the cost of fixing in accordance with the scale of rates set forth below. The Commissioners' inspectors will measure up the work in the first instance, arrange quantities and positions of piping and other materials, and deliver the same at the consumers' premises, with the appliances to be fixed.

Scale of Rates for Fixing Gas Fires and Radiators.

	s.	d.
For connecting-up a fire or radiator with 5-feet run of piping of ¼ in. or ⅜ in. diameter and connections, per fire or radiator	4	9
With from 6 to 10 feet piping and connections	5	9
,, ,, 11 to 15 ,, ,, ,,	6	0
,, ,, 16 to 20 ,, ,, ,,	6	6

For each 10 feet extra run or part thereof, an extra 1s. up to 60 feet from the first connection to the apparatus will be charged.

Any special charges for mason, joiner, or painter, or for structural alteration required in connection with the fitting or fixing of fires, will be borne by the hirer, as provided for in the Commissioners' agreement with hirers.

FLEETWOOD DISTRICT COUNCIL AND THE GAS BILL.

Councillors on their Defeat.

The Sub-Committee of the Fleetwood Urban District Council who had charge of the opposition to the Fleetwood Gas Company's Bill submitted a long report on the matter to a meeting of the Council last Wednesday. After reciting the grounds upon which the Council relied for the insertion of a purchase clause, and the amendments to the Bill obtained by agreement with the promoters, the Sub-Committee expressed regret at not succeeding in getting a purchase clause inserted. "We were advised," said the Committee, "that a better case was never laid before a Committee of either House. Though we did not succeed in getting what we desired, we believe the opposition of the Council will, in the long run, be beneficial to the town, as the weaknesses of the Gas Company have been brought prominently before the notice of the public; and it behoves the Council to watch with greater care the interest of the consumer. The attention of the Gas Company ought certainly to be given to a reduction in the waste of gas caused by leakage, as shown in their own return. In a town like Fleetwood, where there is no settlement through mining, and with its comparatively short length of mains, the leakage ought to be one of the lowest in Lancashire." In moving the adoption of the report, Mr. A. Swarbrick said he was not without hope that the Council would yet acquire the gas undertaking. The Chairman of the Council (Mr. W. C. Frith), supporting the motion, remarked that the ratepayers would see, by the withdrawal of certain clauses in the Bill, that the town had obtained concessions which were quite worth the money expended. The deletion of the clause stipulating that a minimum annual sum should be paid by a gas consumer who was also a consumer of electricity would mean a good deal in the future. The report was then adopted.

Advantage was taken of the opportunity afforded for the Chairman of the Council to reply to Mr. J. J. Robson, a ratepayer, who in a letter to a local paper, stated that the Council had no serious intention of purchasing the gas undertaking except at scrap-iron price. "The Council never had such an idea," declared Mr. Frith. "They were always prepared, and were willing, to pay a fair and adequate price for the gas undertaking." The Chairman also characterized as untrue a further statement made by Mr. Robson that in this matter the Council were out of touch with the ratepayers of the town and the large property owners. He (Mr. Frith) was satisfied that the feeling was practically unanimous in support of the action the Council had taken, notwithstanding that they had not gained all they desired, and what they ought to have had in connection with the Bill.

Aldershot Gas, Water, and District Lighting Company.—The report and accounts of this Company for the half year ended the 30th of June have been issued, in view of the meeting of shareholders on the 2nd prox. The total revenue was £33,734; and the expenditure, £24,016. After providing for the dividend on the consolidated preference stock and interest on mortgage and debentures, the Directors recommend a dividend at the rate of £6 1s. per cent. per annum on the "A" stock, £4 11s. per cent. per annum on the "B" stock (these rates being in accordance with the sliding-scale), and £5 per cent. per annum on the "C" stock—all less income-tax. Exclusive of works and War Department supplies, the sales of gas increased by nearly 6½ per cent. As readers are aware, co-partnership has been introduced. The Directors say the scheme has been well received by all ranks, and it is felt that it will be advantageous to the consumers, stockholders, and employees, whose interests under the sliding-scale and co-partnership are now mutual. The co-partnership item of £383 appearing in the accounts for the first time is for the full year, from July 1, 1911; it having been decided to make the scheme retrospective from that date, and thus appreciate the efforts of the employees.

CALORIFIC POWER TESTS.

The London County Council and Bills in Parliament.

At the Meeting to-day of the London County Council, the Parliamentary Committee will present a report in regard to their action in the matter of the South Suburban and the Wandsworth, Wimbledon, and Epsom District Gas Bills.

The Committee point out that pending certain investigations which they were making into the financial effect of the proposals of the Bills as regards the consumers in the County of London, they postponed action until the Bills reached the House of Commons. Ultimately it was not found necessary to take any action in regard to this aspect of the matter.

The Wandsworth Borough Council, however, decided to oppose the Wandsworth, Wimbledon, and Epsom District Gas Bill, with the object of securing the insertion of amendments setting up a standard of calorific power, with penalties for deficiencies therefrom; and the Council on Feb. 27 consented to allow the Chemist to give evidence in support of the Borough Council's case. The promoters, however, agreed to insert the amendments desired. The standard fixed is 136 calories gross; but no penalty is to be incurred unless the power falls to 122 calories gross. The Bill, as amended, also provides that the test for illuminating power shall cease for the purposes of penalties; but that it shall be continued for information.

After consultation with the Public Control Committee, the Parliamentary Committee decided to press for the insertion of similar amendments in the South Suburban Gas Bill, with the object of securing uniformity in regard to the method of testing. The Council's action was supported by the Lewisham Metropolitan Borough Council—the only authority within the county which tests this Company's gas, although small portions of the Company's area are situated within the Metropolitan Boroughs of Camberwell and Lambeth. As the result of negotiations with the promoters, the Committee say they obtained the insertion of a clause providing for the application (in the area of supply within the County of London) of a calorific test, similar to that provided for in the other Bill—the standard being 540 B.Th.U. gross (which is the equivalent of 136 calories gross), and for penalties if the power falls to 475 B.Th.U.

Universal Gas Methane and "Buisson Hella" Company.—Formal notice has been published to the effect that a general meeting of the members of this Company will be held on Wednesday of next week, in order that there may be laid before the shareholders an account showing the manner in which the winding-up has been conducted and the property of the Company has been disposed of. So ends the career of a Company which was surrounded by so much mystery in its establishment and early "business" operations.

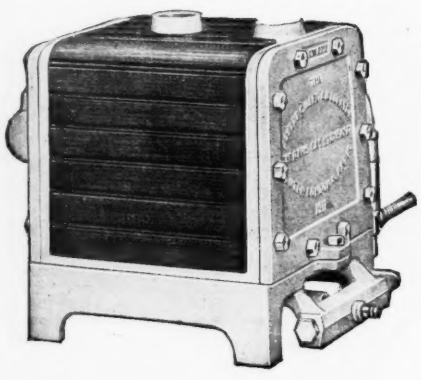
FIRST GARDEN CITY WATER SUPPLY.

Inauguration of a New Reservoir.

The development of the interesting scheme for the establishment of a "Garden City" at Letchworth, in Hertfordshire, due to the initiative of Mr. Ebenezer Howard and the enterprise of a Company formed with the title of First Garden City, Limited, has been noticed from time to time in the "JOURNAL." The estate acquired by the Company covers six square miles, and as soon as it came into their possession in 1904, building operations were commenced. Concurrently with these, provision was, of course, made for the supply of gas and water. The services of Mr. Charles Hunt were secured; and he put up gas-works which were described and illustrated in the "JOURNAL" for Oct. 17, 1905, in which issue an account was also given of the water-works. Further extensions have been necessitated, and these were described in the "JOURNAL" on Nov. 26, 1907, and on Nov. 8, 1910. Owing to the large increase in houses and factories, it has been necessary to have additional water storage, and this was provided last Thursday, when a covered reservoir having a capacity of 500,000 gallons was formally inaugurated in the presence of a numerous company. It is constructed of concrete walls with brick walls and 6-feet arches to support the roof, which is of concrete reinforced with steel joists. The reservoir is lined with natural bitumen asphalte to a few inches above the water-line. A stone fixed on one of the walls bears the following inscription: "Reservoir Constructed by First Garden City, Limited, 1912. Colonel F. S. Bowring, C.B, R.E., Chairman, Engineering Committee. A. W. E. Bullmore, A.M.I.C.E., Engineer." The adjoining reservoir holds 250,000 gallons; so that the total storage is now 750,000 gallons. It has also become necessary to have additional pumping plant, and a third borehole, 24 inches diameter, has been sunk, from which a yield of 30,000 to 40,000 gallons of water per hour is expected. The testing of this bore is now in progress. Since the development of the city commenced, nearly 7500 people have settled at Letchworth, and 49 factories and workshops have been erected. In addition to the county roads already upon the estate, upwards of 9½ miles of new roads have been made, 14 miles of gas-mains and 18½ miles of water-mains laid, and 13¼ miles of sewers constructed.

The visitors assembled at Letchworth Station about three o'clock, and were driven over some of the principal thoroughfares on the estate (the gardens to the houses on which were much admired) to the pumping-station. Entering by the east door, they first saw the suction-gas plant started, and had some particulars furnished by Mr. Bullmore and by Mr. W. H. Gaunt, the Company's Agent. Originally there was only one borehole, 14½ inches diameter and about 215 feet deep; but a second, of similar depth, was called for, and it was entrusted to Messrs. Le Grand and Sutcliff, who have carried out the third one, to which reference has already been made. Passing into the adjoining house, the visitors saw the electrical plant started (the other having been stopped). The lift and force pumps, by the Glenfield and

Gas-Heated Water.



THE proof of the Circulator is in its DURABILITY.

Durability is the outstanding feature of our GILLED CIRCULATOR, as the majority of Gas Authorities can testify from experience on their districts and from personal inspection of the sample in operation at the undermentioned address. We wish to add YOUR name to the majority.

MAINTENANCE.

The DAVIS Gas Stove Co Ltd. Luton

London Show-Rooms: 59, Queen Victoria St., E.C.

(Phone: 742 Bank.)

Kennedy Company, raise from the chalk altogether about 22,000 gallons of water per hour. The quantity of water available when the new borehole is brought into use will amply suffice for the supply of both Letchworth and the neighbouring town of Baldock for some years to come.

After partaking of refreshments, the visitors were conveyed to the foot of the hill on the Great North Road on which the new reservoir has been constructed. The site is 463 feet above sea-level, or about 170 feet above the average height of Letchworth—thus affording an adequate fall. Work was commenced in the first week of the present year; and, but for the coal strike, the reservoir would have been completed by the 1st of June. As it was, water was turned into it on the 1st inst. Its length is 105 feet, breadth 87 feet, and depth 16 ft. 2 in.; the inlet and outlet pipes are 12 inches in diameter. The Contractor was Mr. C. F. Ball; and the cost of the whole is £3000.

Entering the reservoir by means of a special access, the visitors found it illuminated by coloured fairy lamps arranged over the arches and along the terraces. The directorate of the Company was represented by Mr. Aneurin Williams (Chairman), Colonel F. S. Bowring, C.B., R.E., Mr. H. B. Harris, Mr. E. Howard, Mr. T. H. W. Idris, and Mr. H. D. Pearsall; and representatives of the Hertfordshire County Council and neighbouring local bodies were present. Mr. Williams having offered all a cordial welcome, Alderman Neville J. Hine said they must be glad to notice the continual development of Garden City. Years ago, when he entered the County Council, North Herts was called the Wilderness of the county. To-day, where there was once a wilderness, there was, owing to the rise of Garden City, a pleasant valley filled with life and energy. It had been proved that Letchworth had a supply of good, pure water, and now he supposed they would have a practically unlimited supply. They would all be pleased to watch the gradual but sure progress of the estate. It had now a world-wide interest, and was the first and best example of town-planning on modern lines. He had the greatest pleasure in asking Mrs. Ball (the wife of the Contractor) to hand the key to Colonel Bowring, by which he would turn on the water.

The key was enclosed in a chaste silver case, bearing the following inscription:

> "Presented, July 18th, 1912, to Colonel F. S. Bowring, C.B., R.E., on the occasion of his turning on the water into the second reservoir. Letchworth (Garden City), Hertfordshire."

Colonel Bowring then, with Mr. Bullmore, proceeded to turn on the water. As it began to flow over the floor of the reservoir, applause followed, and a verse of the National Anthem was sung.

The party then made their way back to the carriages, and were driven to the Letchworth Hall Hotel, where tea was served. A few congratulatory speeches followed; and the visitors left with expressions of thanks to the Chairman and the Directors of the Company for the opportunity afforded them of seeing Letchworth and its water-works (which are now capable of supplying a population of 30,000), and for their subsequent hospitality.

NOTES FROM SCOTLAND.

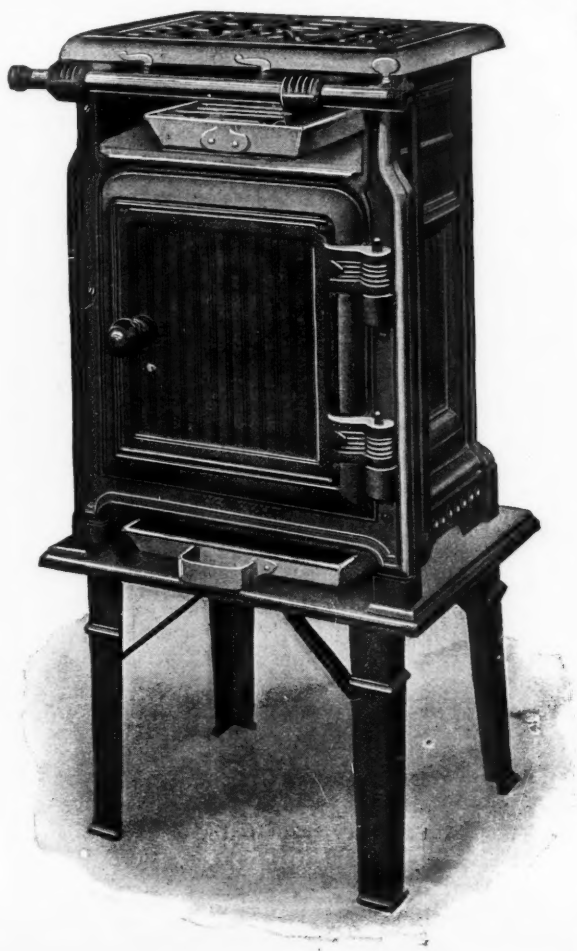
From Our Own Correspondents.

Saturday.

Edinburgh.

For some days a fire has been raging at the Granton Gas-Works, and it is expected that a day or two will yet elapse before it is overcome. A bing of coal, containing approximately 10,000 tons, had been giving off great volumes of smoke, and the outlook became so serious that the Edinburgh Fire Brigade were called in. The bing is enclosed in a brick building with a glass roof; and the seat of the outbreak was low down in the pile of coal. Three lines of hose were first of all turned on the smoking mass by the firemen, and after a time the top layer of coal was thoroughly damped down. The efforts to extinguish the fire were by these means, however, entirely unavailing, and smoke still continued to belch out from the heart of the heap. On Friday afternoon, when it was seen that the ordinary means of fire extinction were futile, it was determined to cut a passage through the mass of coal, which is some 14 or 15 feet in height, and thus confine the fire to one end of the bing. The coal was still burning, apparently in lesser volume, to-day. The cause of the fire is supposed to be due to spontaneous combu stion.

Annan.—The annual meeting of the Annan Gas Company was held in the office of the Company on Wednesday—Provost Foster, the Chairman, presiding. The Directors' report showed that the total revenue for the year was £3836, and the expenditure £2842; leaving a surplus of £994 to be carried to profit and loss account. The comparison with the previous year's working is as follows: Receipts, £3726; expenditure, £2980; net revenue, £745. The disposable balance at the credit of profit and loss account is £1063, out of which the Directors recommend the payment of a dividend of 7 per cent., free of income-tax, which will absorb £630; that £300 be added to the contingent and insurance fund; and that the balance of £133 be carried forward to the next account. There has been no expenditure charged to capital account in the past twelve months. The gas made during the year was 20,249,000 cubic feet—being a decrease of 141,800 cubic feet as compared with the make of the previous year. There was, however, an increase in the gas sold, made possible by a reduction in the leakage, or gas unaccounted for. The number of automatic slot-meters and ordinary meters in use at June 15 was 986—a total increase of 21; and the number of slot and ordinary cookers out on hire was 431—an increase of 26. Gas unaccounted for has decreased during the year from 6¼ per cent. to a fraction less than 4 per cent., which represents a saving of half-a-million cubic feet. The total quantity of coal carbonized was 1821 tons. The sale of coke amounted to 605 tons—an increase of 26 tons on the previous year. Sulphate manufacture has yielded an extra profit; but the sale of tar and liquor shows a reduction. A sum of £62 was paid out of the tar and liquor account for a new distilling plant, which accounts for the deficiency. The report was adopted.



A "Kent" or "Sussex" Cooker on stand placed in your Show-Room will elicit a large number of enquiries and orders.

These compact cookers are of undoubted efficiency, while the stand makes them as convenient to work with as larger cookers of greater height.

"KENT" & "SUSSEX" COOKERS

The original and most popular cookers of their class. Can be fitted with plate rack.

R. & A. MAIN, LIMITED,

WORKS:

Gothic Works, EDMONTON, N.; Gothic Iron-Works, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES:

25, Princes St., Oxford Circus, W.; 136, Renfield St., GLASGOW; 56, Broad St., BIRMINGHAM; 83, Old Market St., BRISTOL; 13, Whitworth St. West, MANCHESTER; 333, Queen St., MELBOURNE; 12, Cunningham Lane, Pitt St., SYDNEY; and 8, Exchange Place, Donegall St., BELFAST.

Berwick.—The ordinary general meeting of the shareholders of the Berwick and Tweedmouth Gaslight Company, Limited, was held on Wednesday—Mr. R. P. Lee, the Chairman, presiding. The accounts for the year ending May 15 showed that the net profit realized was £1224. A dividend of 10 per cent., free of income-tax, on the allotted capital of the Company was declared. The report was adopted.

Brechin.—The annual meeting of the shareholders of the Brechin Gas Company, Limited, was held on Monday—Mr. James Guthrie presiding. The report showed that the amount at the credit of the profit and loss account two years ago was £1228. Last year it was £1463; and this year £1874. The amount to be paid in dividend this year was greater by £71 than last year; while they carried forward £141 more. Residuals produced less by £70, owing to the fact that more gas was manufactured from the coal. The total amount of gas made was 29 million cubic feet—an increase of 1½ millions over last year. Hitherto the works had been depreciated by £400 per annum; but this year the Company have made a new departure, and have only reduced them by £252—the balance of £200 being placed to the reserve. They had done this as the works were already worth much more than they stood in the balance-sheet. The report was adopted.

Hawick.—The annual general meeting of the Hawick Gaslight Company was held on Friday. Provost Melrose moved the adoption of the Directors' report, which recommended that the price of gas remain the same. A sum of £900 had been spent in purchasing cooking-stoves, which were now provided to consumers free. The Directors anticipated that the consumption of gas would fully repay the expenditure.

Kirriemuir.—At the annual meeting of the Kirriemuir Gaslight Company, a dividend of 6 per cent., with a bonus of 1 per cent., was declared. Notwithstanding the considerable advance in the price of coal, it was decided not to raise the price of gas for next year. With the discount allowed, this approximates 4s. per 1000 cubic feet.

Lochgelly.—At the twenty-seventh annual meeting of the Lochgelly Gas Company, Limited, the Directors reported a decrease of 990,900 cubic feet in the gas made, but an increase of 1,497,000 cubic feet in the quantity sold. The sum at the credit of the profit and loss account, including the balance carried forward, was £1786; and the Directors recommended a dividend at the rate of 7½ per cent., free of income-tax. This would absorb £1275, and leave £511 to be carried forward.

Montrose.—The annual meeting of the shareholders of the Montrose Gaslight Company was held on Wednesday—Mr. Alexander Muirden presiding. Mr. A. Mackay, the Engineer and Manager, submitted his annual report, showing the gas manufactured during the year to be 34,810,000 cubic feet—an increase of 1,900,000 cubic feet as compared with the previous year. There were 297 cooking appliances fixed during the year, and the number of new consumers was 174. The balance-sheet showed a profit, after deduction for depreciation, amounting to £1313. It was agreed that a dividend of £2 12s. 6d. per share be paid—the same as last year. Notwithstanding the considerable increase in the cost of coal and other raw material, the Directors anticipate that they will be able to avoid any increase in the price of gas.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 20.

Sulphate of Ammonia.

There has been practically no change in the situation during the past week, but if anything the tone of the market seems to have been somewhat steadier for near delivery. This has evidently been brought about by the covering of former contracts for July shipment, as consumers have not displayed much interest. At the close, the values are £14 2s. 6d. to £14 3s. 9d. per ton f.o.b. Hull, £14 3s. 9d. to £14 5s. per ton f.o.b. Liverpool, and £14 5s. to £14 6s. 3d. per ton f.o.b. Leith. For future delivery, manufacturers persist in refusing to make sales unless they can obtain a substantial premium on spot prices; but dealers are reported to be selling as far ahead as March next year at about the equivalent of prompt values.

Nitrate of Soda.

This article is without alteration in either tone or value, and quotations are repeated at 11s. and 11s. 1½d. per cwt. for ordinary and refined quality respectively, on spot.

LONDON, *July* 22.

Tar Products.

The markets for tar products remain very firm. Pitch is fairly firm, and there has been a good inquiry in the home trade for prompt delivery. Foreign consumers, however, are still withholding their purchasing at the moment. Benzols continue firm; and there is a fair amount of inquiry for this and next year's delivery. Solvent and heavy naphthas are steady; but there is no alteration in the price. Crude carbolic is a little confusing. High prices are paid for prompt delivery; but there is no business possible for forward. Creosote is exceedingly firm; and transactions at very good prices are reported.

The average values during the week were: Tar, 27s. 9d. to 31s. 9d. *ex* works. Pitch, London, 52s. to 52s. 6d.; east coast, 51s. 6d. to 52s.; west coast, Clyde 52s. to 53s. 6d., Manchester 50s 6d. to 51s 6d., Liverpool 51s. to 52s. Benzol, 90 per cent., naked, London, 1s.; North, 11½d. to 1s.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 9½d. to 9¾d. Toluol, naked, London, 10½d. to 11d.; North, 10d. Crude naphtha, in bulk, London, 5d. to 5½d.; North, 4½d. to 5d. Solvent naphtha, naked, London, 1s. 1½d. to 1s. 2d. f.o.b.; North, 1s. to 1s. 1½d. f.o.b. Heavy naphtha, naked, London, 11d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3d. to 3½d.; North, salty, 2¾d. to 3d.; liquid, 3d. to 3⅛d. Heavy oils, in bulk, 3½d. to 3⅝d. Carbolic acid, casks included, 60 per cent., east and west coast, 2s. 6d. to 2s. 7d. Naphthalene, £4 10s. to £10; salts, 45s. to 50s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been a little more inquiry for this article during the past week, which has been the means of steadying prices. Actual Beckton

The "SUPER-ACME"

Gas Cooker

is carefully thought out, and perfected; it embodies more *real points* for the User than any other Cooker yet introduced.

All parts are standardized and are not nominally but **actually** interchangeable.
Gas rail in front.
Hinged and improved hotplate.
Wrought-iron top-bars.
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Increased space behind oven gates, ensuring perfect ventilation and uniform heat.

ARDEN HILL & CO.,
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STON, BIRMINGHAM.

250.

is still quoted at £14; outside London makes, £13 7s. 6d. to £13 10s.; Leith, £14 5s. to £14 6s. 3d.; Hull, £14 5s.; Liverpool, £14 5s. to £14 6s. 3d.; Middlesbrough, £14 5s.

*** The prices for tar in the Manchester district now range from 42s. to 43s.; while for forward contracts, the figures are 37s. 6d. to 40s. 3d.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is more active both for prompt delivery and for forward contracts. In the steam coal trade, best Northumbrians are firm at 13s. 9d. to 14s. per ton f.o.b.; second-class steams are about 11s. 6d.; and steam smalls are from 9s. to 10s. The production is tolerably full at the collieries, and is well taken up. In the gas coal trade, there is a fair demand for this season of the year; and the prices are based on about 12s. 9d. to 13s. per ton for best Durhams. Second-class gas coals are 11s. 6d. to 11s. 9d. per ton; and "Wear" specials are from 14s. The large contracts for the South are now partly closed. The London Companies have bought some large quantities of "specials" at about 16s. per ton delivered; while prices for good second-class are at or near 11s. per ton f.o.b. The prices are higher than last year by from 2s. 6d. to 2s. 10d. per ton; but these cannot be looked on as more than approximate figures until the bulk is secured. The contract for Eastbourne is believed to be settled—for some 40,000 tons, at about 11s. 6d. per ton f.o.b. There are other contracts that are pending; but the figures that are given are indications at least of the prices that are expected to rule. Coke is firmer. For good gas coke, the current quotations are about 18s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

On account of the holidays, no actual business was done on the Glasgow Coal Exchange during the week; and from what can be gathered from independent sources, the tendency of prices is towards greater firmness.

Selby Gas Workers' Wages.—At the monthly meeting of the Selby (Yorkshire) Urban District Council last week, the Gas Committee reported that they had considered an application from the stokers for an increase of wages of 2s. per week, and of 6d. per day for the men firing the boiler when the sulphate of ammonia plant is working. The Committee recommended that the wages of the stokers should in future be 4s. 9d. per day for 16 retorts, 5s. 1d. per day for 18 retorts, 5s. 5d. per day for 20 retorts with one coal wheeler, and 5s. 5d. per day for 24 retorts with two coal wheelers (the weight of coal in each case to be equivalent to 14 cwt. per bed of six retorts); and that the leading stokers should be paid 3d. extra for each day the sulphate plant is working for firing the boiler. The report was adopted.

Swansea and Municipal Coal.—The Town Clerk (Mr. Lang Coath) has reported to the Swansea Parliamentary and General Purposes Committee, on the subject of a municipal coal supply, that he had been in communication with the Town Clerk of Bradford, where the question had been also discussed. Both he (Mr. Lang Coath) and the Town Clerk of Bradford agreed that, in order to introduce such a supply, parliamentary powers would be necessary. At Bradford no decision had been come to. The Committee decided to defer the matter.

Raid on a Gas Manager's Luggage.—A raid on luggage belonging to passengers who were travelling by train from Paddington Station was described on the 13th inst. at the Marylebone Police Court, when Henry Blake, a young man of gentlemanly appearance, was charged with stealing a suit-case containing 25s., two circular notes for £5, and other articles value £40, belonging to Mr. Harold E. Riley, Manager of the St. Austell Gas-Works. He was further charged with forging and uttering the two circular notes and a banker's cheque for £25, with intent to defraud Messrs. Thomas Cook and Son. It was stated that on the 29th of June Mr. and Mrs. Riley arrived in London from Paris, on their way home. Having seen their luggage locked up in a carriage, they went to the refreshment-room, and a few minutes before the train was due to start they missed a suit-case from under the seat and also a holdall. The articles stolen included, in addition to the circular notes, a cheque-book on a St. Austell bank, and a letter of indication, by means of which the signature of the holder of the circular notes could be identified. In prisoner's room at his hotel, a detective found several cheques signed in Mr. Riley's name, and sheets of paper bearing a number of efforts to imitate his signature. Prisoner was committed for trial.

Colne Valley Water Company.—The report of the Directors for the half year to June 30, which will be submitted at the meeting of the Colne Valley Water Company on the 2nd prox, states that capital expenditure amounting to £3225 has been incurred for the purchase of additional land at the Eastbury pumping-station, payments on account of contracts in course of execution at these works, and general main extensions to provide new supplies. It is anticipated that the Eastbury station will be in full use in the summer of next year. An issue of "D" stock was made in March, the average price obtained exceeding 165½ per cent. To meet the growing needs of the Company's district, the proprietors will be asked at an extraordinary meeting to authorize a further issue of capital as required. The profit on revenue account for the half year amounted to £16,001. After paying interest on the debenture and preference stocks and transferring £1000 to the contingency fund account, there is a balance of £18,956. The Directors recommend the payment of the full statutory dividends of 10 and 7 per cent. per annum on the several classes of ordinary stock, and in addition a payment of 1 per cent. (actual) on account of back-dividends on the "A," "B," and "C" stocks—leaving £5457 to carry forward. For the corresponding period of 1911, the amount carried forward, after transferring £1000 to the contingency fund account and paying the same dividends, was £4219.

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An Award for Gas.

At the annual Cricket Festival held at Tunbridge Wells the week before last, the illumination of the town was carried out, as in the past few years, on a fairly extensive scale. Electricity was largely utilized for festoons, &c., in the streets, and for the public buildings; but the utility of gas for decorative and illumination purposes was effectively demonstrated by the Tunbridge Wells Gas Company, as a result of which the Company were awarded the handsome solid silver challenge shield given to the Tradesmen's Association for annual competition, by Mr. D. Elliott Alves. A silver miniature replica accompanies the shield. The Company's design was both artistic and unique, and consisted of a framework of jets surrounding the front of the gas offices. In the centre was a scroll of jets forming the word "Welcome," with the letters "L" and "Y" on either side of "K" (representing the opposing teams to Kent—*i.e.*, Lancashire and Yorkshire). Two illuminated lanterns of a transparent green ground, with illustrations of a batsman and bowler, were placed on either side, while filling in the front of the balcony was a fine collection of choice blooms, palms, and plants. In large white letters on a red ground were the words "Success to our Week." In the twilight, the illumination had the appearance of lines of molten gold, and was particularly effective. Each evening large crowds gathered in front of the offices in order to admire the illuminations.

Wanganui Municipal Gas-Works.

In his report to the Wanganui Borough Council for the year to March 31 last, the Gas Engineer and Manager, Mr. G. D. Stone, stated that the profits showed a considerable increase over the previous year; the total profit, including the increased value of stocks, being about £4780. The output of gas was 10 per cent. more than in the preceding year. In fact, during the six years since March, 1906, the gas consumption has increased by 107 per cent. The number of new meters put in during the past twelve months was 360, the highest recorded for one year. The make of gas per ton of coal carbonized averaged 13,422 cubic feet. Large extensions of the plant have been carried out, and Mr. Stone foreshadows the necessity for a continuance of this policy. "From present indications," he says, "the percentage of increased consumption of gas in 1912 will be quite as large as the percentage of increase for the year just closed." In a separate report he recommended that the following discounts should be allowed to suburban consumers using a gas-cooker or a large grill having cost not less than 15s.: 1500 cubic feet per month, 35 per cent. off, paying 6s. 6d. per 1000 feet; 2500 feet per month, 40 per cent. off, paying 6s. per 1000 feet; 5000 feet per month, 45 per cent. off, paying 5s. 6d. per 1000 feet—a fair proportion of the gas consumed to be used for cooking purposes in either a gas-cooker or a large grill. The price of gas at present being charged in the town varies from 4s. 3d. to 5s. per 1000 cubic feet.

Mansfield's Municipal Undertakings.

Mansfield, the youngest of Nottinghamshire boroughs, has just been celebrating its coming-of-age as a municipality; and, concurrently with the event, some interesting figures are available, in relation to operations during the past twelve months, significant of the profitable nature of the Corporation trading concerns. The totals are not large; but they are instructive, in view of the circumstance that 25 years ago Mansfield was a place of comparatively meagre proportion, but has since developed into a centre of considerable commercial activity mainly through the exploitation of mineral wealth which has been found to lie in the territory contiguous to Sherwood Forest. A profit of nearly £7000 was made last year upon gas, water, and electricity supplies which are in the hands of the Council; the largest individual contribution being £2850 from water. The gas-works earned a surplus of £2650; it being estimated that the amount would have been nearly £400 more, but for the extra expenditure entailed through the coal strike. The electricity accounts show a profit of £1400; and from the three sources, it was decided at a meeting held on Friday last to apply £4100 in aid of the rates, the remainder being devoted to the several reserve funds. Towards this total, in the alleviation of local burdens, the water profits supply the larger share—£2000; gas being responsible for £1500, and electricity for £600.

Cost of Gas Purification at Oldham.—At a meeting of the Gas Committee of the Oldham Corporation last Wednesday, Alderman H. Wilde, the Chairman, said that the General Manager (Mr. Arthur Andrew) had furnished him with some particulars respecting the expense of gas purification during the past few years—the figures including materials and wages. In 1909, the cost was £1900; next year it had fallen to £1178; in 1911, the total was reduced to £555; and for the year ended March last the expenditure under this head was only £345. This he considered a very satisfactory result, and fully justified the Committee in the purchase of the particular material they had used.

Proposed Amalgamation of the Ashton and Hurst Mills Gas Companies.—It is announced that the negotiations which have been taking place between the Directors of the Ashton Gas Company and the Board of the Hurst Mills Gas Company either for amalgamation or for the acquisition by the former Company of the undertaking of the latter, are likely to lead to something definite. The Hurst Mills Company supply the whole of the urban district of Hurst; and where the borough of Ashton joins Hurst there have for some time been difficulties, not only as to the public lighting, but also as to the supply of gas to householders—the question of going into each other's territory having frequently been raised by both Companies. An extraordinary meeting of the proprietors of the Ashton Company has been convened for the 7th prox., for the purpose of empowering the Directors to create and issue, under the powers of the Ashton Gas Act, 1877, such new ordinary shares or stock as they may think fit.

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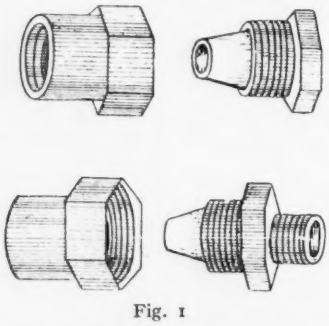

Fig. 1

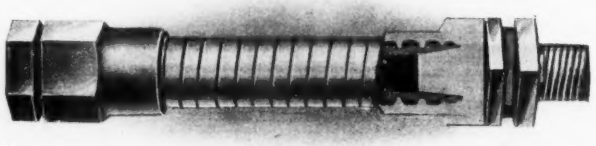

Fig. 2.

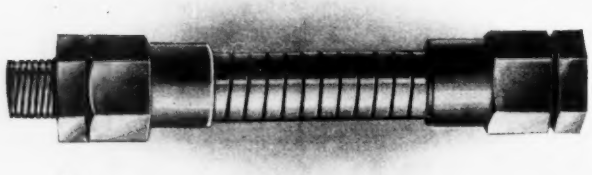

Fig. 3.

Fig. 1.—The Conical Plunger which, being fixed into the Metallic Tube, makes a sound joint.

Fig. 2.—The Plunger in position and its effect.

Fig. 3.—The Flexible Tube complete with Connection screwed, male on one end and female on other.

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A Rotherham District Water Scheme.

Last Tuesday, Dr. A. W. Brightmore held a Local Government Board inquiry at Rotherham into an application by the Rotherham Rural District Council to borrow £14,027 for the purpose of providing a sufficient water supply for the parishes of Bramley, Brampton-en-le-Morthen, Hooton, Levitt, Laughton-en-le-Morthen, Maltby, Ravenfield, Ulley, and Wickersley. Two years ago there was an inquiry into an application for a loan of £8596 for providing a similar scheme, with the exception of service-mains for Maltby and Laughton, which parishes did not then possess sufficient assessable value to raise the full amounts required. The application was not proceeded with. Owing to colliery developments, the district is becoming thickly populated; and the parishes are for the most part dependent upon shallow wells for their water supply. It was explained by Mr. J. H. Pickford (from the office of Messrs. Oxley and Coward, Clerks to the Council) that the water supply from Sheffield was well known to be pure and wholesome, and a provisional agreement had been entered into, the price to be paid to Sheffield being 9d. per 1000 gallons. An alternative scheme for Maltby was submitted on behalf of the Maltby Main Colliery Company by Mr. Gichard, who said it was intended to collect the water from various springs and store it for distribution to both the old and the new villages of Maltby. The cost would be considerably less than that of the scheme of the Council for Maltby alone; the total figure being put at £8768.

Hoylake and West Kirby Gas and Water Company.

The report of the Directors and the accounts for the year ending June 30 (which will be submitted at the thirty-fifth ordinary general meeting of the Company) show that the balance at the credit of profit and loss, after payment of the dividends in respect of the year to June, 1911, is £2473, to which has to be added the net revenue for the past twelve months, £8687—making a total of £11,160. Deducting the interim dividend paid in January (£2600), there is available a sum of £8560. From this, the Board recommend the payment of the following dividends: 6 per cent. on the "A" gas original capital; 4⅛ per cent. on the "B" gas additional capital; 6 per cent. on the "A" water original capital; and 4½ per cent. on the "B" water additional capital. These will absorb £3899, and leave a balance of £4661. After transferring £250 to the water back-dividend reserve, £1000 to the gas, and £500 to the water contingency and plant renewal fund, and adding £532 to the gas reserve fund, there is left a sum of £2378 to carry forward. The dividend scheme, together with the interim dividend paid in January, represents a total distribution, less income-tax, for the year of 10 and 7 per cent. on the "A" and "B" capitals respectively. The gas reserve fund will then stand at £2697. The quantity of gas supplied last year to private consumers and the public lamps was 61,637,680 cubic feet. The price of gas during the period under review was 3s. 6d. per 1000 cubic feet, less varying discounts; while the charge to users of prepayment meters was 4s. 2d.

Sale of Shares in the Hollingworth Gas Company.—One thousand ordinary "B" shares of £1 each (maximum dividend 7 per cent.) in the Hollingworth Gas Company, Limited, were offered for sale by public auction at the Gun Inn, Hollingworth, last Wednesday; and they were all disposed of—the majority at an average of £1 3s. 6d. each. For some time past the "B" shares have earned a dividend of £5 5s. per cent. The new capital is required chiefly for an extension and reconstruction of the plant, so as to bring it up to nearly double its present producing capacity.

Price of Gas at Rochdale.—In view of the request made by the Rochdale Trades Council for a reduction in the price of gas, the Works Sub-Committee of the Corporation Gas Committee have asked the Engineer and Manager (Mr. T. Banbury Ball) to prepare a return showing the prices charged by other authorities for gas, and also for the hire of stoves and meters; and, further, dealing with the practice in regard to the fixing of stoves and meters. When this information has been obtained, the Sub-Committee will consider the position and make a recommendation. The price of gas to ordinary consumers is now 2s. 6d. per 1000 cubic feet.

Bawtry Public Lighting.—A meeting of the parishioners of Bawtry, near Doncaster, was held last Thursday, to discuss the subject of the lighting of the town. A sum of £87 was asked for under the Lighting and Watching Act. The Chairman (Mr. W. Kellett) explained that the Bawtry Gas Company would provide 100-candle instead of 20-candle lamps, and they would be lighted sixteen days longer. With the £12 the Council had in hand and a 4½d. rate, they would be able to light the town through the coming season. It was agreed to sanction the sum required. A resolution that the Council should pay on the quantity of gas burnt was defeated, as was also one that the Council should make the best terms they could with the Company. A poll was demanded.

Bahia Blanca Gas Company, Limited.—The Directors of this Company report for the year ended Dec. 31 last that the amount brought forward from the previous account is £688, and the balance of revenue account is £464—making £1152, which they propose to carry forward. The Directors regret that the trading profits show a decrease of £2299. The sales of gas have decreased by 59,403 cubic metres; and the receipts for gas sold are less this year by £1532. Sales of residuals also show a reduction of £1209. During the year, affairs generally in Bahia Blanca were very bad, due to the prolonged drought; and the Company's business has consequently been very adversely affected – no less than 523 meters having been disconnected, and only 466 new consumers secured. Since the turn of the year, matters have shown marked improvement; and it would appear that the town is now entering upon a further stage of development and extension, the beneficial effects of which are already being felt by the Company—gas sales gradually improving and new customers coming in. Considerable additions have been made to works and plant; and an increased expenditure on capital account of £10,039 has been necessary.

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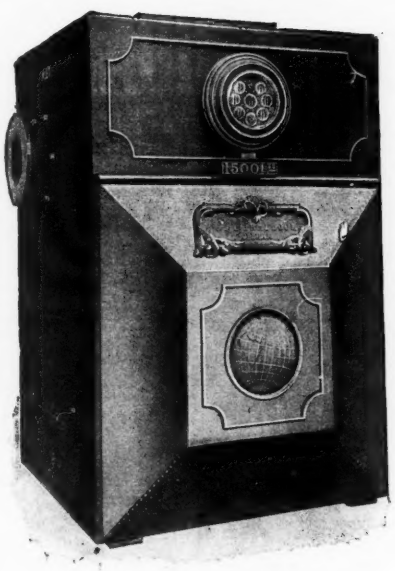

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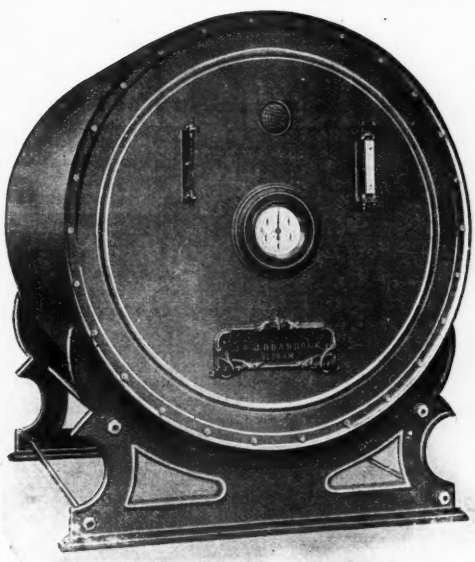

No. 245. Braddock's Large Wet Meter.

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Gas Supply of Ellesmere Port.—"There is," says the "Liverpool Post," "a feeling of indignation among the ratepayers of Ellesmere Port at the action of the Directors of the Shropshire Union Company, respecting a public petition presented to them last September, urging a reduction in the price of gas. Many years ago a Parish Council granted to the Company perpetual rights to supply gas to the town. During the past ten years, the price of gas has been reduced by only 3d. To-day it stands at 4s. per 1000 cubic feet, in addition to which the Company charge for meters. Despite the public petition, which was forwarded through the Urban Council, no reply has yet been received from the Company. The Council has decided now to apply to the Local Government Board for a Provisional Order to supply electricity, and it intends to ensure for itself as the corporate body the right of the future supply for the district."

The Whitwell and District Gas Company, Limited, has been registered with a capital of £10,000, in £1 shares.

The National Insurance Commissioners have acceded to the request made by a Special Committee of the Manchester Corporation that the officials having permanent salaries shall be exempted from the Insurance Act, subject to the Corporation guaranteeing benefits in respect to sickness and disablement.

A company has been formed, under the title of Henry Matthews and Son, Limited, with a capital of £5250 (5000 cumulative preference shares of £1 each, and 5000 ordinary shares of 1s. each), to carry on the business of manufacturers of incandescent mantles and burners and accessories carried on at 12, Charterhouse Buildings, E.C., and to adopt an agreement with Mr. Henry Matthews.

The Birkenhead Town Council, acting on the report of the Gas Engineer and Manager (Mr. T. O. Paterson) in regard to the desirability of providing a pan-ash washing plant for washing and separating the refuse, ashes, and clinkers obtained from the water-gas plant, boilers, and furnaces at the gas-works, have accepted the tender of Messrs. Head, Wrightson, and Co., Limited, of Stockton-on-Tees, for the installation of the machinery.

With the object of encouraging the love of horticulture and floriculture among the employees of the South Metropolitan Gas Company, an exhibition of flowers, vegetables, fruit, &c., was held twelve months ago; and so successful was the initial venture that it was decided to repeat the experiment this year. That the Committee were justified was shown by the fact that at the exhibition which was held on Saturday, the 13th inst., on the sports ground at the Old Kent Road station, there were 385 entries, compared with 115 last year. The opening ceremony took place at three o'clock; the Chief Engineer of the Company (Mr. W. Doig Gibb), who had promised to perform it, giving place to the Mayor of Camberwell (Alderman W. Brenchley, J.P.). Others present were Mrs. Doig Gibb, Mr. H. Talbot (chief of the Lighting Department), Messrs. John Surman and F. Whitehead, and the officials. Mr. Doig Gibb said there was no greater pleasure than to work among flowers and vegetables. He offered hearty congratulations to all on the quality of the exhibition. As houses and other buildings sprang up around, the task of growing produce became more difficult; so that the display was all the more creditable. The Mayor of Camberwell also briefly congratulated the exhibitors on the quality of their products. The prizes were distributed at six o'clock by Mrs. Doig Gibb. Mr. H. Manley, in proposing cordial thanks to Mr. and Mrs. Doig Gibb, said that whatever was done to promote a spirit of unity among the co-workers always had the support of the officials of the Company which was indispensable for bringing it to a successful issue. The motion having been enthusiastically carried, Mr. Doig Gibb said he always desired to come among the employees and to know them individually. The number of entries spoke very highly of their energy and ability in their gardening pursuits, particularly under the restricted conditions in which they were placed.

APPLICATIONS FOR LETTERS PATENT.

15,919.—Deutsche Gasglühlicht Akt.-Ges. (Auerges.), "Precipitating and separating thorium from other rare earths." July 8.
15,949.—Aron, H., "Wet-meters." July 8.
15,977.—Burkheiser, K., "Increasing the yield of ammonia from gases of dry distillation." July 8.
16,002.—Ahronsberg, M., "Gas-controllers." July 9.
16,026.—Keith, J. & G., "Gas-heated irons," &c. July 9.
16,046.—Eaton, T., "Gas-fittings." July 9.
16,075.—Hughes, T., "Gas-meters." July 9.
16,119.—Perry, H., "Brackets for gas." July 10.
16,123.—Fiechtl, L., and Breuning, R., "Automatically closing gas-pipes." July 10.
16,134.—Allgemeine Elektricitäts-Ges., "Prepayment meter for electricity or gas." July 10.
16,172.—Burkheiser, K., "Removing sulphuretted hydrogen from gases." July 10.
16,173.—Hunter, C. M., "Atmospheric burners." July 10.
16,215.—Batten, F. C., "Combined gas and coal fire." July 11.
16,221.—Mason, W. J., "Coin-controlled mechanism for meters." July 11.
16,225-6-7.—Société Anonyme Burkheiser-Eloy, "Coking or gas ovens." July 11.
16,243.—Schaetzel, G. H., "Lighting burners." July 11.
16,300.—Boulton, P. R., "Analysis of gases." July 12.
16,323.—Mallinson, J., "Globe-holder." July 12.
16,393.—Denny, M. E., "Thermostatic apparatus." July 13.
16,400.—Fletcher, Russell, and Co., Ltd., and Rowson, F. G., "Gas-cooking hot plates and grillers." July 13.

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GAS COMPANIES' STOCK AND SHARE LIST.

Again our weekly review of movements on the Stock Exchange is a melancholy chronicle of depression and decay. Not a market seemed to have any resisting power to stem the fall in prices. Another blow was struck the already sorely wounded gilt-edged group by the Chancellor's extraordinary speech of Thursday; and Consols fell at one drop far below the then unparalleled price of a week ago. Other leading departments sympathized; and even tempting prices could scarcely attract buyers. The opening day was another Black Monday; and markets looked doleful. Government issues were terribly flat, and Consols marked 75—a fall of $\frac{3}{8}$. Rails were lower on sales by weak bulls; but Americans held fairly firm. Consols fell further on Tuesday; and all gilt-edged securities were lower in the face of hardening money. On Wednesday, everything kept slipping down. Consols touched $74\frac{7}{16}$, Rails were irregular, and Americans relapsed. On Thursday, the tendency was variable. Consols made a show of mending at first, but fell back again at a loss of $\frac{1}{4}$. Railways extracted a grain of comfort from dividend reports; and Americans were better. Things were worse than ever on Friday. Consols fell $\frac{5}{8}$, and touched 74; buyers being shy of stock on offer. Pretty nearly all prices in Rails were lower, and Americans swayed uncertainly. Saturday was very dull, and the markets half deserted. Consols were again done at 74, then rallied to $74\frac{5}{16}$, and afterwards fell again; the closing price being 74 to $74\frac{1}{4}$—a fall of no less than $1\frac{1}{4}$ in the week. In the Money Market, there was a good demand early in the week to meet calls on new issues. Of course, most of it was going abroad out of this country. Discount was about unchanged. In the Gas Market, there was a very fair show of business, all circumstances considered. Movements in price were uneven; there being about as many advances as retrogressions in the quotations. The Gaslight and Coke Company issued the always welcome announcement of an increase in the dividend to the rate of £4 17s. 4d. per cent., together with an addition of nearly £42,000 to the undivided balance from last half year; but the market did not seem to catch at it. The ordinary stock was done at $102\frac{1}{2}$ to $103\frac{1}{2}$; and the quotation was put down $\frac{1}{2}$. In the secured issues, the maximum was dealt in at 82 and 83 (a fall of 1), the preference at 99 and $99\frac{1}{2}$, and the debenture at 75. South Metropolitan was quiet and unchanged at $117\frac{1}{2}$ to 119; and the debenture marked from 77 free to $78\frac{1}{4}$. There was no business in Commercials. Among the Suburban and Provincial group, Bournemouth "B" realized $16\frac{5}{16}$ (a fall of $\frac{1}{2}$), Brentford new 198 and 199, British 45, ditto debenture $91\frac{1}{2}$, and South Suburban debenture 122—a rise of 2. All three Bromley issues were put up 2 each. In the Continental companies, Imperial had a few transactions ranging from 180 to 182 (a fall of 1), Union had one at $85\frac{1}{2}$, European one at $19\frac{1}{2}$, and Malta two at $4\frac{3}{4}$ and $4\frac{7}{8}$. Among the undertakings of the remoter world, Bombay changed hands at $6\frac{1}{2}$ and $6\frac{1}{4}$, Buenos Ayres debenture at 94, Melbourne at 101, Primitiva at $7\frac{1}{8}$ to $7\frac{5}{16}$, ditto preference at $5\frac{1}{8}$ to $5\frac{5}{16}$, San Paulo preference at $11\frac{3}{4}$ to 12, and ditto debenture at 51.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	73—78	..	6 8 2
374,000	Stk.	July 12	4	Do. 4 p.c. Deb.	89—91*	..	4 7 11
250,000	5	Apl. 12	7½	Bombay, Ltd.	6—6½	..	5 15 5
50,000	10	Feb. 29	15	Bourne- } 10 p.c.	28½—29½	..	5 1 8
332,000	10	"	7	mouth Gas } B 7 p.c.	16—16½	−¼	4 4 10
75,000	10	"	6	and Water } Pref. 6 p.c.	14¼—14¾	..	4 1 4
380,000	Stk.	"	13	Brentford Consolidated	258—263	..	4 18 10
330,000	"	"	10	Do. New	196—201	..	4 19 6
50,000	"	"	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
206,250	"	June 14	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
219,055	Stk.	Feb. 29	11	Brighton & Hove Orig.	215—220	..	5 0 0
244,200	"	"	8	Do. A Ord. Stk.	156—159	..	5 0 8
490,000	20	Mar. 28	12½	British	44½—45½	..	5 9 11
120,000	Stk.	June 28	4	Do. 4 p.c. Deb. Stk.	91—93	..	4 6 0
109,000	"	Feb. 15	6	Bromley, A 5 p.c.	130—135	+2	4 8 11
165,700	"	"	4½	Do. B 3½ p.c.	100—103	+2	4 7 5
82,278	"	"	5½	Do. C 5 p.c.	119—122	+2	4 10 2
55,000	"	June 28	3½	Do. 3½ p.c. Deb.	78—80	..	4 7 6
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	93—95	..	4 4 3
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	3½—4½	..	—
100,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	74—78	..	5 15 5
157,150	Stk.	Feb. 15	5	Chester 5 p.c. Ord.	110—112	..	4 9 3
1,513,280	Stk.	Feb. 29	5/9/4	Commercial 4 p.c. Stk.	108—110	..	4 19 4
560,000	"	"	5½	Do. 3½ p.c. do.	103—105	..	5 1 6
475,000	"	June 14	3	Do. 3 p.c. Deb. Stk.	73—75	..	4 0 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	83—86	..	4 13 0
200,000	"	"	7	Do. 7 p.c. Pref.	133—135	..	5 3 8
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	"	—	4	Do. Deb. Stk.	104—105	..	3 16 2
840,150	10	Jan. 31	10	European, Ltd.	19½—20½	..	4 17 7
15,160,600	Stk.	Feb. 15	4/17/4†	Gas- } 4 p.c. Ord.	102¼—103¼	−¼	4 14 11
2,600,000	"	"	3½	light } 3½ p.c. max.	83—85	−1	4 2 4
4,062,235	"	"	4	and } 4 p.c. Con. Pref.	98—101	..	3 19 3
4,531,705	"	June 14	3	Coke } 3 p.c. Con. Deb.	74—76	..	3 18 11
258,740	Stk.	Mar. 14	5	Hastings & St. L. 3½ p.c.	93—95	..	5 5 3
82,500	"	"	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	16¼—17	..	6 9 5
131,000	Stk.	Mar. 14	7½	Ilford A and C	155—158	..	4 14 11
65,780	"	"	6	Do. B	123—125	..	4 16 0
65,500	"	June 28	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
4,940,060	Stk.	May 15	9	Imperial Continental	180—185	−1	4 17 3
1,235,000	Stk.	Feb. 15	3½	Do. 3½ p.c. Deb. Red.	88—90	..	3 17 9
200,242	Stk.	Mar. 14	6	Lea Bridge Ord. 5 p.c.	125—129	..	4 13 0
561,000	Stk.	Feb. 29	10	Liverpool United A.	219—221	−½	4 10 6
718,100	"	"	7	Do. B.	157—159	−1	4 8 1
306,083	"	June 28	4	Do. Deb. Stk.	99—101	+1	3 19 3
75,000	5	June 14	6	Malta & Mediterranean	4⅛—4¼	..	6 3 1
560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb.	—	..	—
250,000	100	"	4½	Melbourne } 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	May 31	3½	Monte Video, Ltd.	11½—11¾	..	5 19 2
1,775,892	Stk.	Feb. 15	4½	Newc'tle&G'tesh'd Con.	100—102	..	4 5 9
529,705	Stk.	June 28	3½	Do. 3½ p.c. Deb.	85—85½	..	4 1 10
55,940	10	Feb. 29	7/7/0	North Middlesex 7 p.c.	14—15	..	4 18 0
300,000	Stk.	May 15	8	Oriental, Ltd.	134—136	..	5 17 8
60,000	5	Mar. 14	8	Ottoman, Ltd.	7¼—7¾	+¼	5 3 3
31,800	53	Feb. 29	13	Portsea Island A	—	..	—
60,000	50	"	13	Do. B	130—133	..	4 17 9
100,000	50	"	12	Do. C	127—130	..	4 12 4
398,490	5	May 15	8	Primitiva Ord.	7⅛—7⅜	..	5 8 6
796,980	5	June 28	5	Do. 5 p.c. Pref.	5⅛—5⅜	+⅛	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
312,650	Stk.	June 28	4	River Plate 4 p.c. Deb.	93—95	..	4 4 3
275,000	5	Apl. 12	12	San Paulo, Ltd.	13½—14½	..	4 2 9
150,000	10	"	6	Do. 6 p.c. Pref.	11¼—12¼	..	4 18 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Mar. 14	10	Sheffield A	234—236	..	4 4 9
209,984	"	"	10	Do. B	233—235	..	4 5 1
523,500	"	"	10	Do. C	233—235	..	4 5 1
90,000	10	May 31	7½	South African	8—9	..	8 6 8
6,429,895	Stk.	Feb. 15	5/9/4	South Met., 4 p.c. Ord.	117—119	..	4 11 9
1,895,445	"	July 12	3	Do. 3 p.c. Deb.	76½—79½*	..	3 15 6
209,820	Stk.	Feb. 29	8½	South Shields Con. Stk.	157—159	..	5 6 11
605,000	Stk.	Feb. 15	5/16/8	S'th Suburb'n Ord. 5 p.c.	122—124	..	4 14 0
60,000	"	"	5	Do. 5 p.c. Pref.	117—120	..	4 3 4
117,058	"	July 12	5	Do. 5 p.c. Deb. Stk.	120—122*	+2	4 2 0
502,310	Stk.	May 15	5	Southampton Ord.	105—107	..	4 13 6
120,000	Stk.	Feb. 15	7⅛	Tottenham } A 5 p.c.	144—147	..	4 17 0
483,940	"	"	5 2/9	and } B 3½ p.c.	116½—118½	..	4 14 11
149,470	"	June 28	4	Edmonton } 4 p.c. Deb.	94—96	..	4 3 4
182,380	10	June 15	5	Tuscan, Ltd.	8⅛—8⅝	..	5 15 11
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97—99	..	5 1 0
295,476	Stk.	Feb. 29	5	Tynemouth, 5 p.c. max.	112—114	..	4 7 8
255,636	Stk.	"	6⅞	Wands- } B 3½ p.c.	141—144	..	4 15 6
85,766	"	June 28	3	worth } 3 p.c. Deb. Stk.	70—72*	..	4 3 4

Prices Marked * are "Ex Div." † Next dividend will be at this rate.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ENGINEER AND MANAGER. Ashton in Makerfield Urban District Council. Applications by July 31.
MANAGER. Maryport Urban District Council. Applications by July 31.
DRAUGHTSMAN. No. 5610.
DRAUGHTSMAN. Messrs. R. & J. Dempster, Limited, Manchester.
LIGHTING SUPERINTENDENT. Londonderry Gaslight Company.
MECHANIC. Maidstone Gas Company.
GAS METER MAKERS. Portsea Island Gaslight Company. Applications by July 29.
REPRESENTATIVES (AGENCIES). No. 5609

Appointments, &c., Wanted.

AGENCY (AUSTRALIA). No. 5612.
CHEMICAL PLUMBER. No. 5611.
OUT-DOOR DEPARTMENT. (No Salary) No. 5608.
SULPHATE PLANT MAKER AND REPAIRER. No. 5592.

Plant, &c. (Second-Hand), for Sale.

CONDENSERS. Walker and Wallsend Gas Company.
GASHOLDER, ROOFS, &c. Leicester Gas Department. Tenders by July 29.
LAMP COLUMNS AND LANTERNS. Barnsley Gas Company.
PASTRY OVEN, OVEN AND RANGE, BOILER, WHISK MACHINE, GAS GRILL, TANK, &c. V. Benoist, Limited, 36, Piccadilly.

Patent Licences for Disposal, &c.

GAS GENERATING FURNACES. Young and Co., Southampton Buildings, W.C.
METERS. Haseltine, Lake, and Co., 7 and 8, Southampton Buildings, Chancery Lane, W.C.

Stocks and Shares.

EXMOUTH GAS COMPANY. By Tender July 31.
SOUTHEND WATER COMPANY. London Mart. July 30.

Meetings.

BRENTFORD GAS COMPANY. St. Ermin's Hotel. Aug. 2. 2.30 o'clock.
SOUTH METROPOLITAN GAS COMPANY. De Keyser's Hotel. Aug. 14. Two o'clock.
SOUTH SUBURBAN GAS COMPANY. De Keyser's Hotel. Aug. 2. Three o'clock.
THE GASLIGHT AND COKE COMPANY. Chief Office, Horseferry Road, S.W. Aug. 2. Twelve o'clock.

TENDERS FOR

Coal and Cannel.

BANGOR (CO. DOWN) URBAN DISTRICT COUNCIL. Tenders by Aug. 5.
BATLEY CORPORATION. Tenders by July 31.
COMMERCIAL GAS COMPANY. Tenders by July 25.
EXMOUTH GAS COMPANY. Tenders by July 26.
HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by Aug. 5.
HEREFORD GAS DEPARTMENT. Tenders by Aug. 10.
ROTHWELL GAS DEPARTMENT. Tenders by Aug. 12.
SWADLINCOTE GAS DEPARTMENT. Tenders by Aug. 1.

Gasholder (Re-Sheeting).

HOLYWOOD GAS COMPANY.

Gasholder and Tank (Concrete).

HUDDERSFIELD GAS DEPARTMENT. Tenders by July 31.

General Stores (Lime).

SWADLINCOTE GAS DEPARTMENT. Tenders by Aug. 1.

Oil for Gas Making.

BARROW-IN-FURNESS CORPORATION. Tenders by July 30.

Tar and Liquor.

HEREFORD GAS DEPARTMENT. Tenders by Aug. 10.
RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by Aug. 6.

Valves, &c., for Gasholder Tank.

HUDDERSFIELD GAS DEPARTMENT. Tenders by July 31.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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THE Directors of the above Company desire to THANK the very numerous Applicants who responded to their advertisement, and to inform them that the APPOINTMENT OF SECRETARY HAS NOW BEEN FILLED.
CHAS. HUNT,
Chairman.
July 22, 1912.